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A Guide to USWRLD--the USDA-MSU Version of the IIASA World Food and Agriculture Model and Computer Program

by

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Trade Policy Branch
International Economics Division

August 1983

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Agriculture

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A Guide to USWRLD--the USDA-MSU Version of the IIASA World Food and Agriculture Model and Computer Program. By Michael H. Abkin, Consultant. International Economics Division, Economic Research Service, U.S. Department of Agriculture, Washington, D.C. August 1983. ERS Staff Report No. AGES830729

ABSTRACT The USWRLD system is the USDA-Michigan State University adaptation of the world food and agriculture model developed by the Food and Agriculture Program of the International Institute for Applied Systems Analysis. This guide provides analysts and computer programmers with (a) a functional description of the model's representation of the world food and agriculture system and, in particular, the U.S. component; and (b) a description of the structure and use of its FORTRAN program. This will enable both analysts and programmers to communicate with each other in (a) incorporating model improvements and extensions; (b) implementing policy scenarios and options; and (c) interpreting simulation results.

Keywords: agricultural trade, policy analysis model, global model, simulation, U.S. agricultural model, general equilibrium model.

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Acknowledgements

This guide has been prepared under Cooperative Agreement No. 58-3J22-0-00245 between the Department of Agricultural Economics at Michigan State University and the Economic Research Service of the U.S. Department of Agriculture. As such, it is the result of work performed by a team of people. Some of them have documented their contributions elsewhere (see Appendix E), but I would like to present a complete list here. Working team members under this Cooperative Agreement have included: at MSU--Michael Abkin, Forrest Gibson, Robert Gustafson, Hsin-Hui, Glenn Johnson, Manuel Lopez Blanco, Dennis Warner, and Paul Wolberg; at USDA/ERS--David Hopkins, Douglas Maxwell, William Quinby, Ralph Seeley, Abraham Subotnik, Shu-Hwa Tuan, and David Watt. Administrative team members have been: at MSU--Michael Abkin, Larry Connor, Glenn Johnson, and Christopher Wolf; at USDA/ERS--Kenneth Farrell, Charles Hanrahan, William Kost, John Lee, Douglas Maxwell, Larry Otto, J. B. Penn, Leroy Quance, Vernon Roningen, and Kelley White. Special recognition goes to Julia Mckay for her secretarial support at MSU; and to Rose Mayhew, Theresa Wells and Verleece Brown for theirs at USDA/ERS, including the word processing and publication of this manuscript.

The above-referenced Cooperative Agreement called for the development of the detailed U.S. model, its integration with the IIASA/FAP global system, and the installation of that system at the USDA's Washington Computer Center. An intermediate U.S. model, developed separately from this Agreement as part of the IIASA/FAP basic linked system and financed by MSU and IIASA, is also operational at WCC. Since it is included in the system and, thus, in this guide, it is appropriate to acknowledge the contributors to that model here as well: Michael Abkin, Thomas Christensen, Daniel Kaufman, Tracy Miller, Donald Mitchell, and Christopher Wolf. Actually, this list includes only the direct contributors to the intermediate U.S. model and excludes the much larger set of people contributing to the MSU Agricultural model from which it was derived.

The USWRLD system documented here is the MSU-USDA version of the IIASA/FAP global system of national food and agriculture models. It is fitting and proper that the major developers of the basic linked system at IIASA's Food and Agriculture Program, including standard country models and the trade linkage algorithms, be recognized here as well (also see Appendix E for bibliographic references): Guenther Fischer, Klaus Frohberg, Michiel Keyzer, Kirit Parikh (Director, 1980-present), Ferenc Rabar (Director, 1976-1980), and Ulrike Sichra.

Finally, special acknowledgement must be made of George E. (Ed) Rossmiller, who initiated the MSU-IIASA connection and has followed the project through the years with his interest and sage advice, first at MSU and later at USDA/FAS.

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A Guide to USWRLD--the USDA-MSU Version of the
IIASA World Food and Agriculture Model
and Computer Program

Michael H. Abkin*

Chapter 1

INTRODUCTION AND OVERVIEW

This guide, intended for analysts and computer programmers conversant with FORTRAN, has two principal objectives.

1. To provide analysts with a) a functional description of the model's representation of the world food and agriculture system and, in particular, the U.S. component; and b) a description of the structure and use of the computer program.

This will assist analysts to: (i) become acquainted with the USWRLD system; (ii) incorporate model improvements and extensions into the computer program; (iii) implement policy options and scenarios; and (iv) communicate with computer programmers in accomplishing (ii) and (iii) and in running the model.

2. To provide computer programmers with a) a basic understanding of what the program is trying to do, that is, the underlying simulation model and the real-world system it represents; and b) the program documentation necessary to maintain, modify, update and execute the software system.

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This will assist programmers to: (i) become acquainted with the model and its computer program; and (ii) communicate with analysts in modifying, debugging, and running the program.

For analysts' purposes, the guide is not intended to be sufficient. It must be supplemented with the technical documentations of the various model components prepared by the developers of those components (see Appendix E). Readers not interested in program details are referred to Chapters 2 and 6.

A piece of documentation useful to both analysts and programmers which is not included here is a glossary of variable names. When such a document is prepared, it should include, for each FORTRAN symbolic name, 1) a definition of the variable; 2) subscript definitions; 3) type (real, integer, double precision, logical); 4) location (common, local, formal parameter); 5) subroutines where defined; and 6) subroutines where used.

Following this introduction, Chapter 2 of this guide presents an overview of the functional structure of the model, and Chapter 3 then goes into some detail on the program structure, including flow charts, call sequences, and subroutine definitions. This in-depth examination of the program will serve in understanding the model as well, since the program is organized according to the same building blocks as the model and, anyway, the program is the realized embodiment of the model.

Chapter 4 details how the various subroutines and components communicate with one another and with the user. The use of parameter lists, common blocks, and direct access files for internal communication is described and a rationale given for each. Data input via coded and binary sequential files and block data routines is also described, as are debug and report-writer outputs.

Chapter 5 explains how to implement the USWRLD program on the computer. First, it defines the run control parameters entered on the START data file. It then describes the various modes of operation and tells how to specify which mode and national models are to be run in a particular job. It also discusses the parameters and data files used to initialize and restart the model's simulation.

Recommendations for further model and program development are made in Chapter 6. Development areas covered include the components of the U.S. basic (intermediate) and detailed models; possible eventual linkage with Canadian and Mexican models to serve as a North American model in the international trade system; and other IIASA basic country models.

Finally, five appendices are included which:

A. Discuss supporting data bases for the intermediate and detailed U.S. models and IIASA's basic country models;

B. Describe the detailed and summary output of the basic linked system;

C. Display sample output of the basic linked system and the U.S. intermediate and detailed models;

D. Discuss the differences between the USDA-MSU and the IIASA versions of the system and the rationale for them; and

E. List references cited in this guide and other technical documents giving economic and mathematical descriptions and derivations of the model.

Chapter 2

MODEL COMPONENTS AND INTERACTIONS

The USWRLD system is the USDA-Michigan State University adaptation of the world food and agriculture model developed by the Food and Agriculture Program of the International Institute for Applied Systems Analysis (IIASA/FAP) in Laxenburg, Austria. The background and objectives of IIASA/FAP are described elsewhere [Rabar, 1979; Parikh, 1981], as are those of the USDA-MSU U.S. detailed modeling effort [Abkin et. al., 1981]. This chapter gives a summary of the functional structure of the world model system in general and of the detailed U.S. model in particular. The algorithms developed by IIASA/FAP for solving domestic and international equilibria are also outlined.

International Structure

USWRLD is made up of country models interacting in a world system through trade and, possibly, international agreements. The guiding principle in this system is the general equilibrium approach. There are three concepts embodied in the "general equilibrium approach." First, it is general in that the system is closed with respect to countries, commodities, and money. That is, the whole world is modeled explicitly, as are all commodities and money. In this way, there are no infinite sources or sinks of goods and money to absorb policy impacts and mask feedback and other secondary effects.

The specific countries and, in the case of the EC and the CMEA, country groups include the major food importing and exporting countries and were initially selected to cover about 80% of the world's population, land area, and production, exports, and imports of food. Those currently in operation

at the USDA are Argentina, Australia, Austria, Brazil, Canada, China, CMEA, EC, Egypt, India, Indonesia, Japan, Kenya, Mexico, New Zealand, Nigeria, Pakistan, Thailand, and the United States. Additional countries may be, and are being, added to the system as the need arises. Closing the system, an aggregate rest-of-the-world model is included to endogenize the supply and demand of countries not specifically modeled (i.e., the other 20% of the world).

Two alternative commodity lists are considered in the world model (Table 1). The detailed list includes explicitly those commodities of primary concern in the world food problem and other commodities and commodity groups of importance to particular classes of countries. Again, the aggregate commodity list was defined to simplify initial model building and testing at IIASA of the basic linked system (described in the next section). Although it is still the operative list for the current version of the model, it is much too aggregated to exploit the full potential of the IIASA/FAP system for policy analysis.

Even the detailed list, however, may not be detailed enough for some countries' purposes. Thus, although the international equilibrium, and therefore prices, will be determined at the level of one or the other of the lists in Table 1, a country model may be defined at a finer level of commodity detail. For example, Tables 2 and 3 show the definitions used in the detailed U.S. model for supply and demand commodities, respectively.

Secondly, the concept of <u>equilibrium</u> in the "general equilibrium approach" simply is that physical and monetary quantities must balance over the world for internal consistency. That is, in each year, net excess

Table 1

IIASA/FAP Trade Commodities

Aggregate Version

1. Wheat (th. MT, grain eq.)
2. Rice (th. MT, milled)
3. Coarse grains (th. MT)
4. Bovine and ovine meats (th. MT, carcass)
5. Dairy products (th. MT, fresh eq.)
6. Other meats (th. MT, protein eq.)
7. Protein feeds (th. MT, protein eq.)
8. Other foods (mi. $, 1969-71)
9. Nonfood agriculture (mi. $, 1969-71)
10. Nonagriculture (mi. $, 1969-71)

Detailed Version

1. Wheat (th. MT, grain eq.)
2. Rice (th. MT, milled)
3. Coarse grains (th. MT)
4. Fats and oils (th. MT, oil eq.)
5. Protein feeds (th. MT, protein eq.)
6. Sugar and products (th. MT, refined eq.)
7. Bovine and ovine meats (th. MT, carcass)
8. Pork (th. MT, carcass)
9. Poultry and eggs (th. MT, protein eq.)
10. Dairy products (th. MT, fresh eq.)
11. Vegetables (mi. $, 1969-71)
12. Fruits and nuts (mi. $, 1969-71)
13. Fish (th. MT, protein eq.)
14. Coffee (th. MT, bean eq.)
15. Cocoa and tea (mi. $, 1969-71)
16. Alcoholic beverages (mi. $, 1969-71)
17. Clothing fibers (mi. $, 1969-71)
18. Other nonfood agriculture (mi. $, 1969-71)
19. Nonagriculture (mi. $, 1969-71)

Table 2

U.S. Model Supply Commodities

1. Wheat (th. MT)
2. Rice (th. MT, milled)
3. Corn (th. MT)
4. Grain sorghum (th. MT)
5. Oats (th. MT)
6. Barley (th. MT)
7. Rye (th. MT)
8. Soybeans (th. MT)
9. Peanuts (th. MT, shelled)
10. Sunflower (th. MT, seeds)
11. Flaxseed (th. MT, seeds)
12. Cottonseed (th. MT, seeds)
13. Cotton (th. MT)
14. Sugar cane (th. MT, refined)
15. Sugar beets (th. MT, refined)
16. Irish potatoes (th. MT)
17. Sweet potatoes (th. MT)
18. Dry beans and peas (th. MT)
19. Other vegetables & melons (th. MT)
20. Citrus fruits (th. MT)
21. Noncitrus fruits & nuts (th. MT)
22. Tobacco (th. MT, farm sales wt.)
23. Coffee (th. MT, beans)
24. Wool (th. MT)
25. Beef & veal (th. MT, carcass)
26. Lamb & mutton (th. MT, carcass)
27. Pork (th. MT, carcass)
28. Chicken (th. MT, ready-to-cook)
29. Turkey (th. MT, ready-to-cook)
30. Eggs (th. MT)
31. Milk (th. MT, fresh)
32. Fish (th. MT)
33. Nonagriculture (mi. $, 1972)

Table 3

U.S. Model Demand Commodities

1. Wheat (th. MT, grain eq.)
2. Rice (th. MT, milled)
3. Corn (th. MT)
4. Other grains (th. MT)
5. Soybeans (th. MT)
6. Peanuts & tree nuts (th. MT)
7. Fats & oils (th. MT, oil eq.)
8. Protein feeds (th. MT, soymeal eq.)
9. Sugar (th. MT, refined)
10. Other sweetners (th. MT, refined eq.)
11. Potatoes (th. MT)
12. Dry beans & peas (th. MT)
13. Fresh vegetables (th. MT)
14. Processed vegetables (th. MT)
15. Citrus fruits (th. MT, fresh eq.)
16. Noncitrus fruits (th. MT, fresh eq.)
17. Beef & veal (th. MT, carcass)
18. Lamb & mutton (th. MT, carcass)
19. Pork (th. MT, carcass)
20. Poultry (th. MT, ready-to-cook)
21. Eggs (th. MT)
22. Fresh milk (th. MT)
23. Cheese (th. MT)
24. Butter (th. MT)
25. Other dairy (th. MT)
26. Fish (th. MT)
27. Coffee (th. MT, beans)
28. Cocoa & tea (th. MT)
29. Alcoholic beverages (mi. liters)
30. Cotton (th. MT)
31. Wool (th. MT)
32. Tobacco (th. MT, leaf eq.)
33. Durables (mi. $, 1972)
34. Services (mi. $, 1972)
35. Other nonagriculture (mi. $, 1972)

demand for each commodity, summed up over all countries, must be less than or equal to zero for a unique set of nonnegative world prices. In addition, the world price of a commodity is zero when net excess demand for that commodity is less than zero (free disposal) and positive when net excess demand is zero. Furthermore, when this is true, then Walras' Law holds, with country trade balances adding up to zero.

It is in reaching equilibrium that the country components of the IIASA/FAP global system interact, as illustrated in Figure 1 for a four-country world. Each country is conceived to be composed of three basic components:

(1) a production component, which depends only on predetermined variables, including government plans and policies, lagged prices, and resource, environmental and technological changes;

(2) an exchange component, which encompasses all parts of the country model (primarily demand and income accounting) that are determined simultaneously with prices, given supplies and government policies; and

(3) a government component which adjusts plans and policies over time in response to socioeconomic conditions and changes taking place in the model.

Those parts of supply which depend on concurrent prices--such as nonagricultural and livestock commodities in the U.S. model--are also considered to be in the exchange component. It is the exchange components of the national models that are all solved simultaneously (as indicated by the dotted lines in Figure 1) to determine world and domestic equilibrium prices and quantities.

Finally, while the concept of "general equilibrium" is relatively simple, the approach is certainly not. Since there are no sources and sinks unaccounted for in the model to take up any slack, rigid adherence to a complex set of economic conditions and mathematical theorems--collectively

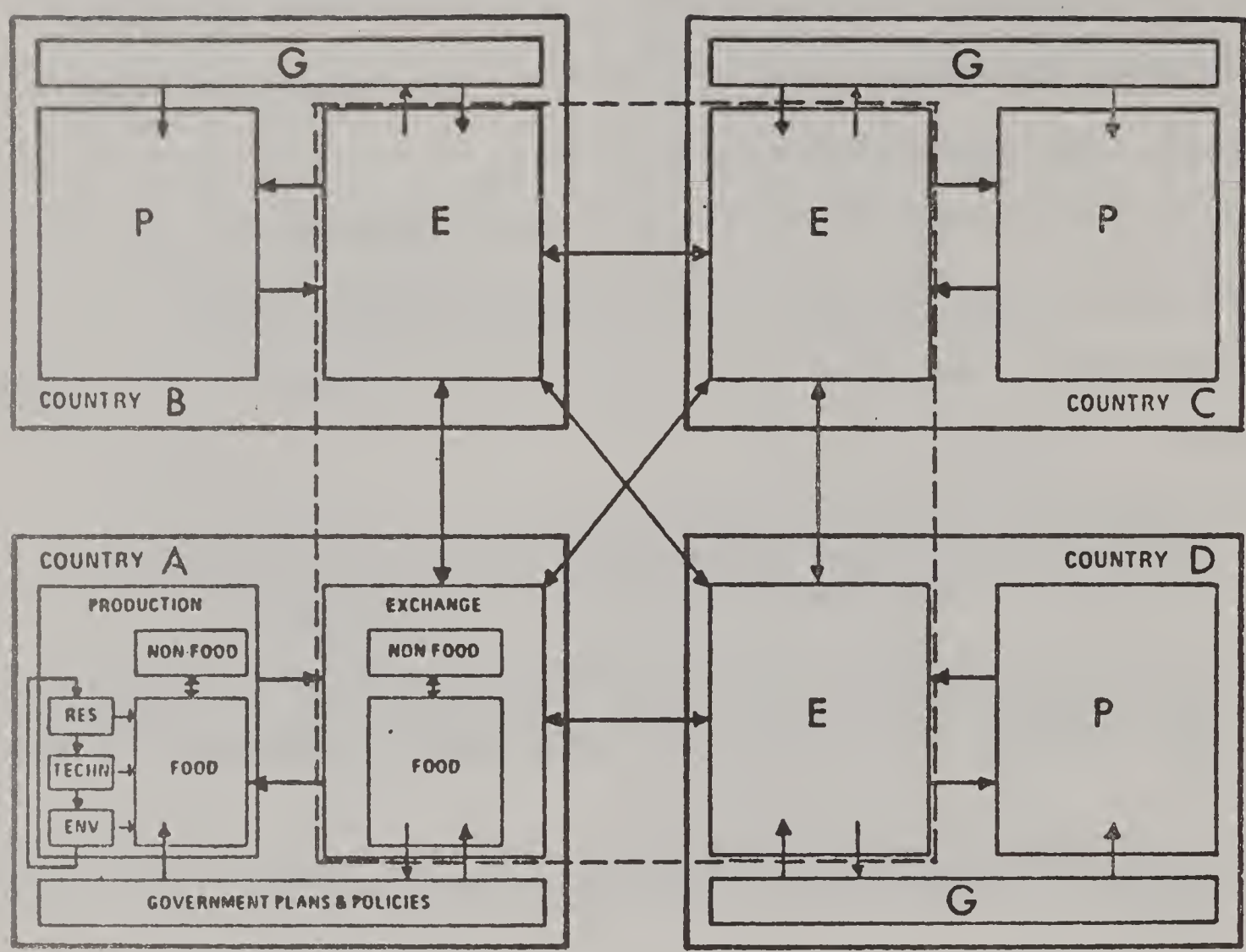


Figure 1

IIASA/FAP International Linkage

Source: Rabar [1979], p. 8.

called general equilibrium theory--is essential for logical consistency. These have all been elegantly developed, complete with rigorous mathematical proofs, for the IIASA/FAP system [Keyzer, 1981], resulting in a "minimal" set of common characteristics each country model must possess in order to be linkable through the international equilibrium algorithm (described below). These linkage requirements include:

1) the country's net excess demand for each commodity must be a continuous function of, and homogeneous of degree zero in, world prices (although, since quota constraints are allowed, the first derivatives do not have to be continuous);

2) a common list of commodities and units of measure (Table 1) must be adopted, at least at the country's interface with the world; and

3) an annual time increment must be used.

An additional requirement, a result of the algorithm used rather than of economic theory, is that:

4) each country model must compute an analytical (not numerical) matrix of partial derivatives of net excess demand for each commodity with respect to each world price.

The Basic Linked System

In IIASA/FAP parlance, the "basic linked system" is the international linkage mechanism (i.e., the world superstructure) together with the set of basic country models which plug into that superstructure.

There may be up to two models of a country--a basic model and a detailed model. All countries specifically included in the system have at least a basic model. A country's detailed model will tend to be more disaggregated with respect to, for example, commodities, regions, income classes, policy instruments, resources, technology, etc., as appropriate for that country. In using the system for a particular analysis, then--such as bilateral or multilateral agreements among particular countries, or impacts of one

country's policies on particular other countries--the detailed models of only those countries of direct concern need be used, with use of the basic (generally simpler) models of other countries being sufficient for the task at hand.

There are two or three types of basic country models. FAP itself developed a prototypical country model whose common structure has been replicated for most of the FAP countries, with parameter estimates for each country derived primarily from FAO data [Fischer and Frohberg, 1980]. These models are called "standard FAP country models" and comprise most of the basic models in the system. For a few countries, country modelers have developed their own basic models. In some cases, these have used the FAP standard model as a point of departure, eventually replacing it. In others, as MSU has done for the U.S. basic model, a model of intermediate complexity has been developed both to serve as a basic model and to gain experience before tackling the detailed model. In one case, that of India, the detailed model is also used as the basic model. Other nonstandard basic models are those of China and the CMEA.

The Detailed U.S. Model

An intermediate U.S. model patterned after the MSU Agriculture Model was developed for use in the basic linked system [Mitchell and Christensen, 1981; Abkin, 1981 (March)]. This section summarizes the structure and components of the detailed U.S. model, developed by the MSU-USDA cooperative research team.

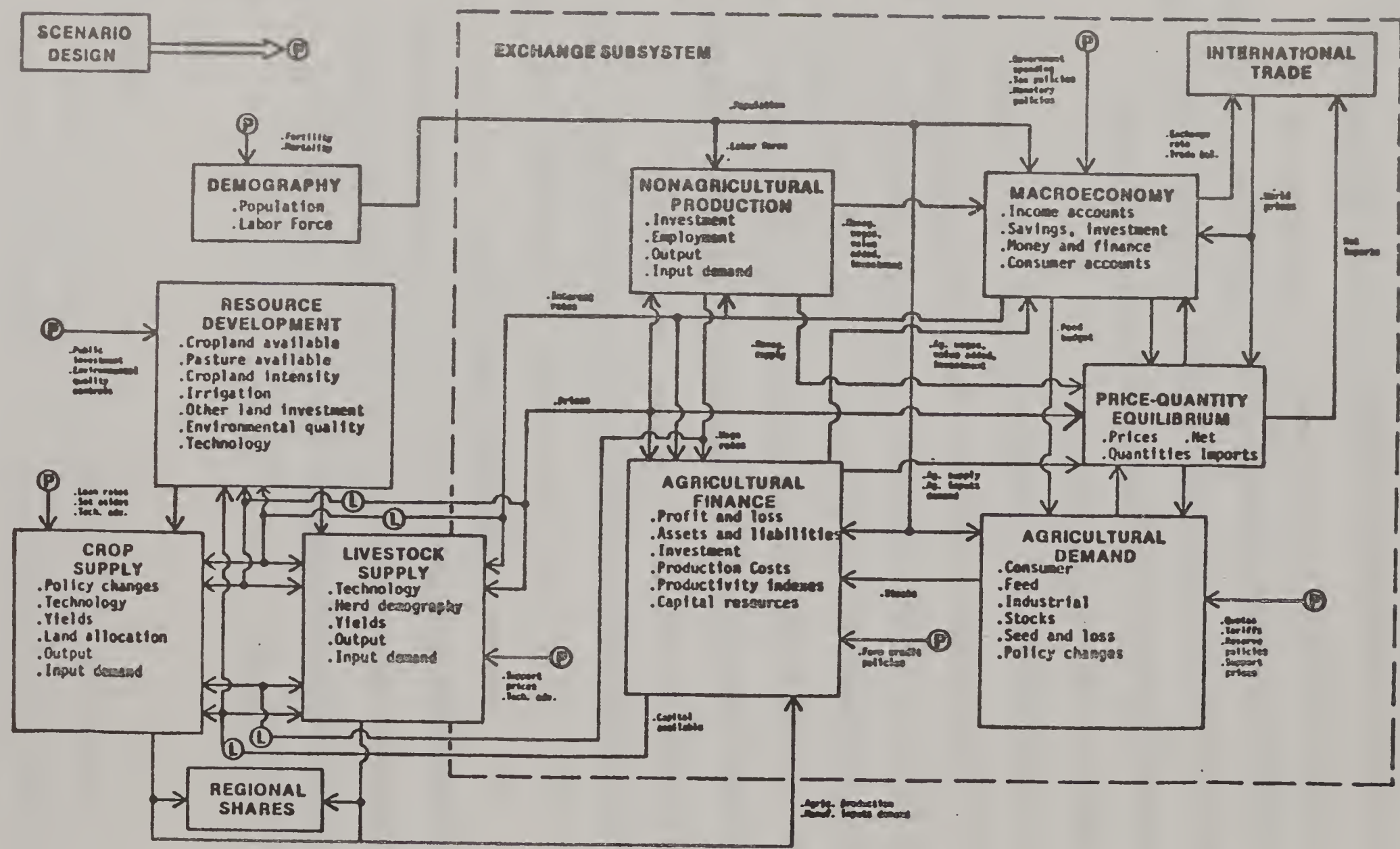
System Overview

Figure 2 shows the components identified in the model system and their major functions and relationships. The dotted line on the right-hand side of the figure encloses the exchange subsystem, including IIASA's

international trade model (comprising other country models and the trade linkage). Essentially, the exchange subsystem is that part of the model requiring simultaneous solution with equilibrium prices and quantities. Outside the exchange subsystem lie the demography component and the agricultural supply subsystem; these depend on lagged prices, as indicated by L in Figure 2. Note that the livestock supply component straddles the dotted line; that is, parts of it, such as feed demand and poultry production, depend on simultaneous prices.

Commodity- and sector-specific policies and scenarios are explicitly considered in the model, some as completely exogenous specifications and others as decision rules guiding endogenous adjustments over time in response to simulated conditions. These are indicated by P in Figure 2. Thus, scenarios, exogenous policies and decision rules are specified in a Scenario Design stage, resulting in policy inputs to specific components. For example, scenarios concerning unprecedented technological advances--perhaps constructed from Delphi or other such processes in the Scenario Design--will influence crop and livestock supply; public investment in irrigation or soil conservation practices will influence the quality and quantity of land resources; commodity set-asides and support prices will affect production; and quotas, tariffs and reserve policies will have an impact on agricultural demand and prices. These and other such policy inputs are shown in Figure 2.

Figure 2
U.S. MODEL SYSTEM DIAGRAM



For the detailed U.S. model, the IIASA commodities are disaggregated into lists of supply commodities (Table 2) and demand commodities (Table 3). The primary difference between the two lists is that the latter includes processed commodities. Production is determined according to the supply list and then converted to the demand list for purposes of supply and utilization accounts and, importantly for the trade connection, computation of net excess demand.

Metric units are used as a standard throughout the model for inter-component communication (except that acres are used for land areas). Within a component, conventional nonmetric units (e.g., bushels, pounds) may be used for convenience of econometric estimation based on standard time-series data. However, the units on component outputs are converted to metric for use in other components.

The intercomponent linkages are self-explanatory in Figure 2, and succeeding sections describe the present status of each of the major components.

Resource Development

The national-level version of this component, contains two econometrically estimated equations -- an upper-bound constraint on total cropland planted and an upper-bound constraint on land planted to intensive crops. All crops except hay, oats, flax, barley, and rye are considered "intensive".

The total acres planted constraint begins with an estimated 900 million acres of potentially cultivable land in 1977. This includes land currently cropped and in cropland pasture; rangeland, forests and farmsteads in Class I-IV land; and an adjustment to allow for potential increases in the

intensity of land use approaching that observed in the Far East and Western Europe. This 1977 figure is then adjusted for subsequent (1) technological advances (exogenously projected) which may increase the potentially cropable land; (2) irreversible soil erosion (also exogenously projected); (3) population increases, assuming .22 acres per capita (from the Demography component); and (4) acreage diversions (from the Crop Supply component).

The intensity constraint is based on an estimated logit function of mechanization and acreage set aside and diverted (from Crop Supply). The current version projects the set asides/diversion and mechanization variables exogenously. This must be done until such time as the components indicated above are further developed to generate that information.

As economic conditions increase the demand for cropland (from the Crop Supply component), up to five percent of unused cropland may be developed and added to the supply of cropland in any year. This is the principle economic feedback to Resource Development.

This version of the Resource Development component is only preliminary. Regionalization is considered of top priority for further development. The concept of intensity as defined here, i.e., crops considered to be intensively cultivated, is only really meaningful at a regional level. In particular, a specific crop may be considered intensive in one region and nonintensive in another. Furthermore, crops grown, land planted in crops, and land potentially cropable vary greatly by region. Thus, the cropland planted constraint would also be more meaningful at the regional level rather than the national level.

Therefore, a regional version of this component has been developed [Johnson and Quinby, 1983] and awaits a corresponding regionalization of crop supply before it can be implemented in the model. Additional

extensions which may be considered in the future include (1) distinguishing between irrigated and nonirrigated land, (2) developing decision functions to model explicitly the investment necessary to bring potentially cropable land into actual production, and (3) modeling measures of land and water quality, effectively endogenizing the currently exogenous soil erosion.

Crop Supply

A preliminary version of this component has been developed, including acres planted, acres harvested, and yield equations for each of the crop commodities indicated in the list of supply commodities (Table 2) plus hay. Acres planted depend partly on participation in commodity programs -- where set-asides, diversions, and loan rates are endogenously determined -- and are constrained by potential cropland and intensity constraints. Crop production is, then, the product of acres harvested and yield. (Cottonseed production is derived from cotton production.) Seed demand and the loss component of disappearance for each commodity are generated from acres planted and total production, respectively. Finally, total cropland planted, total cropland harvested, and a yield index are computed as performance measures and for use in the Resource Development component.

This component is in various stages of development, depending on the commodity. Equations have been estimated for the major grains and some of the minor commodities, such as coffee, flaxseed, tobacco and dry beans. For other commodities, such as fruits and vegetables, equations have been borrowed from MSU's intermediate model for the time being. And for a few, such as sunflower, exogenous projections are used pending further research. In the case of oil-bearing sunflower, it is of so recent a significance that there is as yet little empirical evidence upon which to base a model.

Sunflower experts recommended treating it exogenously until its potential role and competitive position can be more confidently identified.

The commodity programs subcomponent is also borrowed from the intermediate model, having originated in the MSU Agriculture Model. Essentially, it incorporates decision rules specified in the 1977 Farm Bill on set asides, diversions, loan rates, and target prices. Further model development will be necessary to capture later program changes.

Livestock Supply

This component uses the USDA's FAPSIM model as a point of departure [Subotnik, 1981]. It models explicitly the following subcomponents: cattle, including beef, veal, and dairy; hogs; sheep, including lamb and wool; poultry, including chicken, turkey, and eggs; and derived demand for feed, including wheat, corn, sorghum, barley, oats, hay and roughage, soymeal, and other oilseed meal.

The structure of the cattle, hog, and poultry components is similar to different versions of the FAPSIM model. However, some of the equations were respecified, some new equations were added, and all equations were formulated to satisfy IIASA's linkage requirement for homogeneity of degree zero.

The cattle, hog, and sheep models simulate the dynamics of herd demography, with growth lags and age groups identified in the case of beef and dairy cattle. They include equations for births, deaths, slaughter, and meat, milk and wool production. The poultry model determines chicken (broiler and nonbroiler), turkey and egg production, including eggs for hatching. All livestock models, except sheep, project ending stocks of products.

Agricultural Finance

Agriculture Finance plays three key roles in the overall system. First, it is the interface between agriculture and the macroeconomy (including nonagriculture). Agricultural value added is used in the Macroeconomy component as a component of national income. It also generates demands for agricultural inputs based on input prices derived from the aggregate nonagricultural price index, the interest rate, and the national wage rate.

Secondly, Agricultural Finance provides important feedback linkages to agricultural production, principally information on productivity and capital resources necessary for investment/disinvestment decisions in agriculture. Such feedback linkages are still only conceptual in the current version of the detailed U.S. model, since the Resource Development and Crop and Livestock Supply components are not yet developed to the stage of needing that information.

Finally, the component produces tables of various farm accounts. Included are a pro-forma income statement, sources and use of funds tables, a balance sheet for agriculture, and other ratios and indices useful in evaluating the performance of the agricultural sector.

Macroeconomy and Nonagricultural Supply

In the present version of the model, nonagricultural supply is determined as an integral part of the macroeconomy. Indeed, the macroeconomy component includes a model of total national production, from which agricultural production is subtracted to arrive at nonagricultural production. Since agriculture represents such a small part of the nation's output (about 2.4% of GDP in 1972), this simplification may be justified for the time being. However, in later versions of the model it may be desirable

to disaggregate nonagriculture to model explicitly key agricultural input and food processing industries. At that time, it would be better to compute GNP as the sum of sector outputs rather than independently.

Four subcomponents of the Macroeconomy component represent, respectively, supply, the money sector, income accounting, and investment. National output (GNP), the wage rate, and unemployment are determined as part of the simultaneous solution of four equations — a price equation, a wage equation, an unemployment equation, and a potential output production function. In the money sector model, the interest rate is determined by inverting a money demand equation, assuming money demand equals money supply, and relating the rate of growth of the money supply to that of real GNP. The income accounting subcomponent computes national, corporate and personal income accounts and government revenues, expenditures, and deficit; a major output is total consumption expenditures for the Demand component. Finally, inventory, noninventory, and residential investments and capital stocks are determined.

Domestic Supply and Food Processing

The supply and utilization accounts, and hence the net trade needed for the international linkage, are computed based on the demand list of commodities (Table 3). Therefore, it is necessary to convert commodities produced from the supply list (Table 2) to the demand list.

Three procedures are performed by the Domestic Supply component. First, several supply commodities are aggregated into demand commodities. For example, sorghum, oats, barley, and rye are aggregated into "other grains," and chicken and turkey become "poultry."

Secondly, another major difference between the two commodity lists is the inclusion of processed commodities in the demand list. Therefore, a crude food processing sector model determines the production of processed commodities. A proportion of soybeans and peanuts is assumed to be crushed into oil and protein feed and a proportion of fish production is assumed used for meal or protein feed. In the case of soybeans, the proportion crushed is a function of domestic demand for protein feeds. All other oilseeds are assumed crushed. Also, a proportion of corn is assumed used to produce "other sweeteners," and a proportion of vegetables produced is assumed to be processed. Finally, the dairy manufacturing and alcoholic beverages subsectors are modeled. In the case of dairy, proportions of milk production are assumed processed into butter, cheese and other dairy products. Production of alcoholic beverages is exogeneously projected in terms of spirits, wine and beer, with each generating derived demands for wheat, rice, corn, other grains, and fruit.

The third procedure performed by Domestic Supply is to add carry-in stock to the production of each demand commodity to determine domestic supply.

The food processing sector model is admittedly crude at this stage. It relies wholly on constant proportions and, in the case of alcoholic beverages, constant ingredients to account for the processing component of disappearance of raw agricultural commodities and for the production of processed commodities. Further work will be necessary to, first, endogenize key ones of these proportions -- e.g., dairy manufacturing -- and, then at a later stage, perhaps expand the food processing models of certain commodities to capture the structure, growth and decisionmaking processes of those industries.

Demand

For each commodity in the demand list (Table 3), the demand component determines several categories of demand: human consumption; feed, seed and losses; industrial consumption; government demand; stocks; and trade (net excess demand).

Human Consumption

For this component of demand, the commodities were grouped hierarchically, and expenditure shares were estimated for each group at each level of the hierarchy. The translog demand system is used, which conforms with the homogeneity, adding-up, and symmetry requirements of demand theory. At the top level of the hierarchy, total consumption expenditures are allocated to demand for consumer durables, consumer services, other nonfood nondurables, and food. At the second level, other nonfood nondurables is broken into tobacco and other, and food is broken into meat, dairy, fruits and vegetables, cereals, other food, and alcoholic beverages. Successive lower levels disaggregate these food categories further until an expenditure share (and, hence, per capita consumption) is determined for each demand commodity.

Feed, Seed and Losses

The feed component of demand is determined in the Livestock Supply component and converted here from the supply list definition to the demand list. Seed use and losses are netted out of production in the Crop and Livestock Supply components, so they are given zero values here.

Industrial Consumption

Currently, nonfood industrial consumption of each demand commodity is determined by estimated functions developed for MSU's intermediate U.S. model. In the case of corn, a gasohol production component projects the use

of corn to produce ethanol. This component -- also transferred from the intermediate model, having originated in the MSU Agriculture Model -- simulates the growth of gasohol production capacity and capacity utilization as functions of fuel prices, grain prices, and tax incentives. In the absence of a disaggregated nonagricultural sector, the ethanol produced is not accounted for since it cannot be used to increase supplies of (or reduce demand for) fuels. The by-product of dry distillers' grain is, however, accounted for and used to augment supplies of (or reduce demand for) feed grains and protein feeds.

Government Demand

Real government expenditures on goods and services each year are assumed to be a proportion (21%) of an ex ante estimate of that year's real GNP. For lack of data at this time on the commodity breakdown of these expenditures, we are arbitrarily assuming they are all allocated to the three nonagricultural commodities -- durables (60%), services (30%), other nonagriculture (10%). This will result in some underestimation of demand for agricultural products and overestimation of nonagricultural demand, although alternative assumptions can easily be implemented when more information is available.

Stocks

Carry-out stock demand is broken down into separate models of policy stocks and free stocks for the following demand commodities: wheat, rice, corn, other grains, soybeans, peanuts, cheese, butter, other dairy (nonfat dry milk), cotton, and tobacco. [Gustafson, 1982; Abkin, 1982 (November 5)]. In addition, the Livestock Supply component determines (free) stock demand for beef, pork, chicken, turkey, and eggs. Policy stocks are defined to be stocks held by the CCC, stocks under outstanding CCC loans, and, for grains, stocks in the farmer-held reserve program.

The policy stock model assumes a price support objective. Thus, carry-out policy stocks are assumed to be at a maximum near the support price or loan rate and then to decline exponentially with increasing price, approaching zero at the "call" price. For each commodity, econometric estimates of the following parameters of this function are used: (1) the maximum stock level, as a proportion of supply; (2) the price at which this maximum occurs, as a proportion of the support price; and (3) the price, again as a proportion of the support price, at which stocks are within a given tolerance of zero. These parameters, which represent historical averages, may be given other values as policy alternatives for projection purposes.

For some commodities, notably peanuts, cotton and tobacco, the above described function does not fit the historical experience very well. In such cases, alternative functional forms or exogenous projections should be considered.

In any case, policy stock levels so determined are considered target levels. If necessary, they are adjusted, within bounds, in the Price-Quantity Equilibrium algorithm in order to attempt to maintain policy-specified price targets or bounds whenever quota constraints are effective.

Free stocks are projected as econometrically estimated functions of policy stocks, total supply, prices, total food consumption expenditures, and the real interest rate.

Trade

Finally, the net excess demand for each commodity is computed as the sum of all the above components of demand minus domestic supply (production plus carry-in stocks). These excess demands may be subject to quota constraints in the Price-Quantity Equilibrium component.

Prices

Five sets of prices are determined in the model, each one sequentially determining the next and generally following the procedure of the IIASA/FAP standard national model [Abkin, 1982 (November 15)].

First, world prices are exogenous to the national models of the system, including the U.S. These prices are interpreted to be raw product or, in the case of processed commodities, producer export prices. Upon entering the U.S. model, world prices are disaggregated, if necessary, from the aggregate IIASA level to the detailed level, assuming a detailed price is proportional to the aggregate price of which it is a part and adjusted for unit differences. The second set of prices results from a further disaggregation of world prices to conform to the U.S. model's list of demand commodities (Table 3). The disaggregation is done in the same manner as described above.

These world prices are then converted from producer to retail level by the addition of a margin for each commodity which represents the quantity of the nonagricultural good (i.e., marketing, transportation, and processing) required for one unit of the commodity. Two different margins may be used for each commodity to allow for the distinction, at the national level, between import and export prices.

The third set of prices is domestic consumer prices. First, a consumer price is determined for each commodity as a function, including tariffs, of the world retail-level prices described above. In IIASA/FAP parlance, this price is called a "target" price. It may actually be an exogenous policy-specified price, or it may simply represent a normal relationship between domestic and world prices. In any case, this "target" price will be the actual equilibrium price resulting from the Price-Quantity Equilibrium

component if no quantity constraint for that commodity is effective. If a constraint is effective, i.e., maximum excess demand and minimum buffer stock or vice versa, then the equilibrium consumer price will depart from that target -- higher if demand is at its maximum, lower if at its minimum. Upper and lower bounds on the equilibrium price may also be specified.

For some commodities, such as vegetables or eggs, the domestic price in reality bears little or no relation to what might be considered a world price, so that the above price model would appear highly unrealistic. The U.S. generally has little or no trade in such commodities, however. Therefore, the problem of loosening the price linkage can be handled by setting quota constraints close to zero, in which case, if those constraints are effective, the equilibrium domestic price will be determined endogenously rather than by the world price.

Fourth, domestic processing, transportation, and marketing margins are subtracted from these consumer prices to yield producer prices by the demand list of commodities. Then, the fifth set of prices, farm prices by the supply list of commodities, is computed from these producer prices. Allowance is made for one supply price to be a function of more than one producer price. For example, the soybean farm price may depend on both the fats and oils price and the protein feeds price, and the corn farm price may be influenced by the producer prices for corn as grain, for other sweeteners, for alcoholic beverages, and for fuels (because of gasohol, where the fuels price is part of the aggregate nonagricultural price). Crude assumptions are made for these relationships for now; they very much need to be more carefully looked at.

Finally, the price component computes various price indices for use in other components and as performance measures -- the GNP deflator, the

consumer price index, the consumption deflator. Computation of indices of prices received and paid by farmers are also computed, both as performance measures and because the Agricultural Finance component needs that information.

Price-Quantity Equilibrium

This component is an algorithm which solves the demand and price components simultaneously to determine equilibrium price and quantities demanded for the U.S. each year. As part of the IIASA/FAP international linkage equilibrium algorithm described in the next section, world prices are fed into it and it returns U.S. net excess demands consistent with domestic policies (including tariffs and quotas) and the national budget constraint — the definition of domestic equilibrium. The international algorithm, then, iterates on world prices until national excess demands sum to zero over the world -- the definition of international equilibrium.

Domestically, for each international iteration (i.e., each set of world prices), the U.S. detailed model uses the complementarity path algorithm developed for the IIASA/FAP standard national models (described in the next section). The exchange module for the IIASA/FAP standard models is linear, so that solving for prices to satisfy quantity constraints is simply a matter of partitioning and inverting matrices. In general, however, the exchange module of the U.S. detailed model is nonlinear. Therefore, it uses a gradient search algorithm to find, for commodities whose constraints have been violated, prices which minimize the deviation of excess demand from the constraint value.

Equilibrium Algorithms

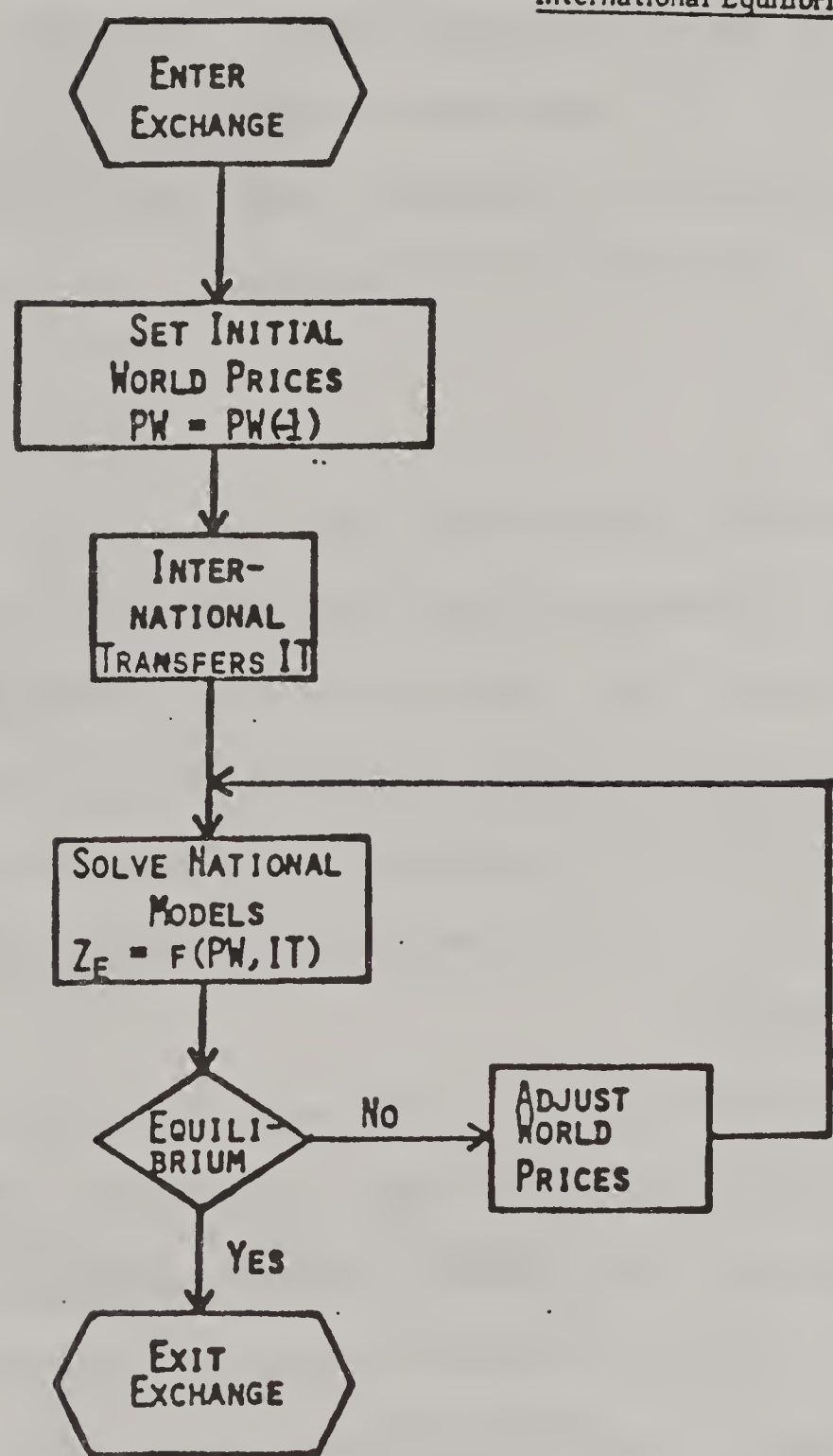
The exchange components of all countries are solved simultaneously each year to find the global, or general, equilibrium. Nested, or hierarchical, iterative algorithms are used in this task, where the international algorithm is at the top of the hierarchy (the outermost iteration loop) and the domestic algorithm is at the bottom (the inner loop). Each of these is briefly described here verbally to give a flavor of how the system works. Rigorous theoretical and mathematical derivations and specifications are given in Keyzer [1981, Chapters IV and VI].

International Equilibrium

A coarse flow chart of the algorithm to achieve international equilibrium is given in Figure 3. Once the exchange component has been entered in a given year, world prices are set to their previous year's equilibrium value to start the iterations. Then, international transfer policies for the current year are set. These are decisions made outside of the exchange equilibrium, i.e., they do not depend on prices in the current year. Such international transfer policies as bilateral or multilateral trade agreements and capital transfers may be considered. In addition, other international policies modeled within the exchange component include buffer stock agreements, external price agreements, and market segmentation. Next, the exchange component of each of the national models is solved in turn for its own domestic equilibrium net excess demand as a function of world prices and international policies. If all the domestic equilibrium net excess demands are consistent with world equilibrium, i.e., they all add up to zero at positive world prices, then the algorithm exits to solve the supply side

Figure 3

International Equilibrium



of the country models for the next year. Otherwise, world prices are iteratively adjusted and the national models solved again until world equilibrium is reached.

The world price adjustments are made with the use of a nonsmooth optimization (gradient search) algorithm [Keyzer, Lemarechal, and Mifflin, 1978; Lemarechal, 1978]. This algorithm is important because, while the excess demand functions must be continuous, their first derivatives may have discontinuities (i.e., the functions are nonsmooth), thus allowing for the use of quota policies.

Domestic Equilibrium

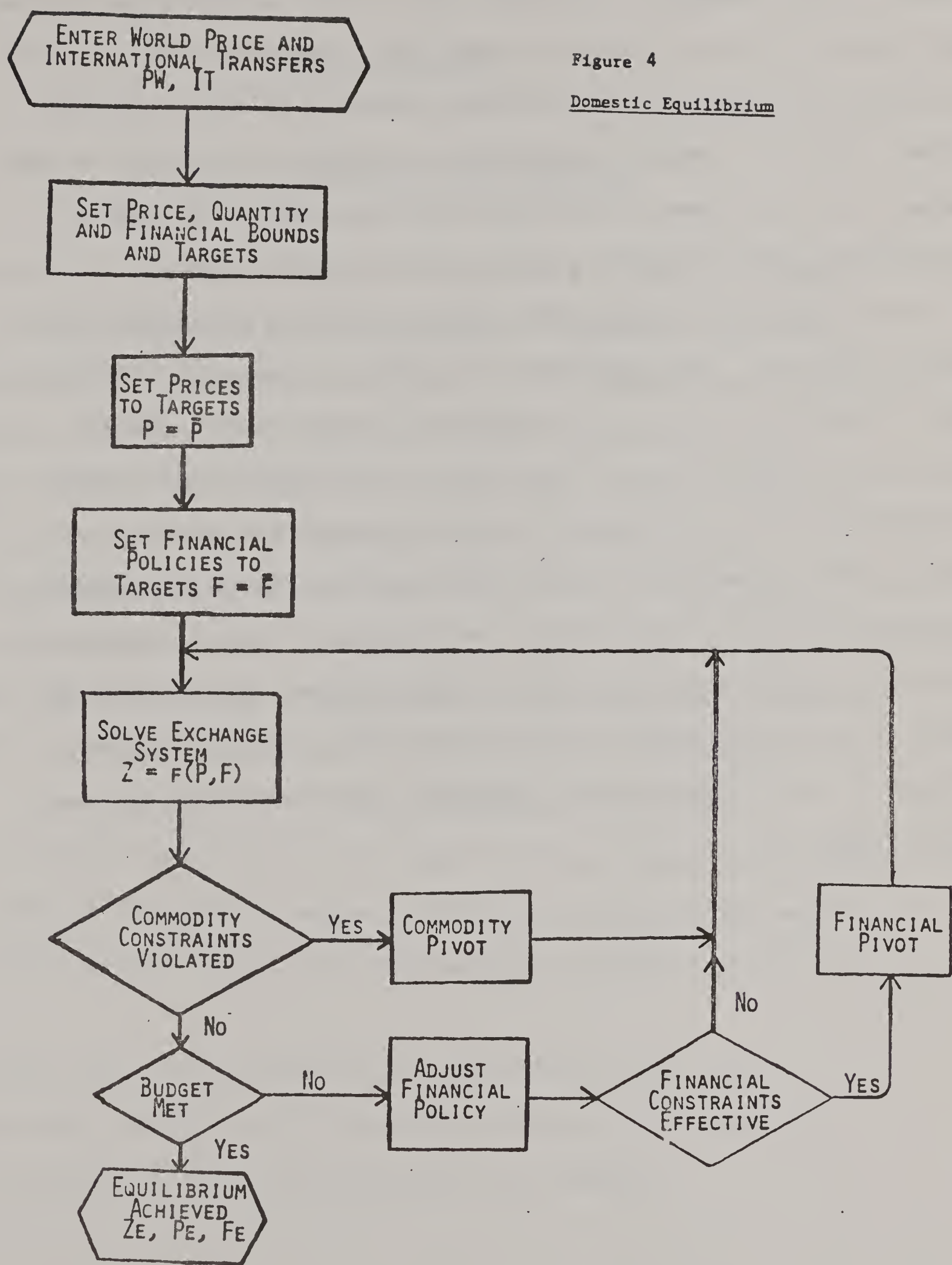
The exchange component of each country model is solved at each iteration on world prices. The complementarity path algorithm described here (Figure 4) was developed by Keyzer [1981, Chapter IV] for the standard FAP models and used by most of the country models, including the U.S. Actually, any algorithm may be used as long as convergence can be proved, the consistency linkage requirements are met, and the matrix of the partial derivatives (the Jacobian matrix) is computed.

First, the bounds specified, if any, are set on domestic prices, buffer stocks, trade, and financial policies. These variables are also set to their target values to start the algorithm. These bounds and targets may be exogenously specified (either from outside the model or based on lagged conditions) or be computed as functions of world prices.

The concept of price "targets" may be interpreted as actual policy targets or merely as a "normal" relationship between domestic and world prices, including any tariffs or subsidies. In any case, however it may be interpreted, these target prices will turn out to be the domestic equilibrium prices if no quantity constraints are effective.

Figure 4

Domestic Equilibrium



trade balance) set to target values, the supply-demand exchange system is solved. If any commodity constraints (price, quota, or stock) are violated, the system is inverted ("commodity pivot") for those commodities to solve for prices which will put the associated quantities at their constraint values. When all commodity constraints are satisfied, and if the national budget is met, the domestic equilibrium has been achieved in terms of equilibrium prices, financial policies, and net excess demands.

If the budget is not satisfied, financial policies are adjusted to achieve that end. These adjustments are made in a hierarchical fashion, where lower priority policies are adjusted first and higher priority policies are adjusted only if lower priority ones have reached a bound ("financial pivot"). The priority ranking, targets, and bounds on tax rates, public consumption, and the trade balance are specified as policy parameters by the user exogenously or as functions of lagged conditions in the model. If the balance of trade is being adjusted, this implies that there is no national budget target to be met and, therefore, only one iteration of the financial policy adjustment loop is necessary to reach equilibrium.

Chapter 3

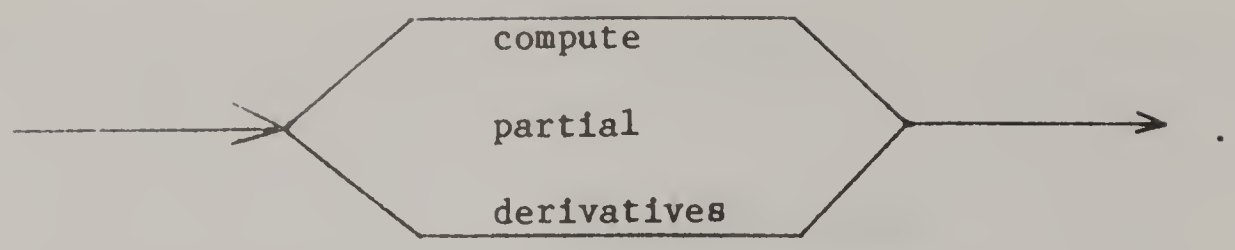
PROGRAM STRUCTURE

Program Flow Charts and Call Sequences

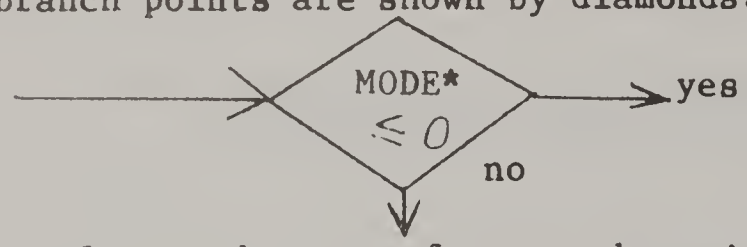
The charts in this section (Figure 5) contain the information normally found in logical flow charts and in subroutine call sequences. While not every statement, loop, and branching is shown, every subroutine and function subprogram is identified in its sequence, and major loops (e.g., the simulation time loop) and branchings (e.g., to country models and for various modes of operation) are indicated. Major operations within subroutines, in addition to calls to other subroutines, are also shown.

These flow charts are meant to represent the logic of the programs rather than the actual coding of the programs. For example, many of these flow charts show control passing sequentially from one sub-program to another. In some cases, each of these sub-programs is in reality a subroutine whereby control returns to a single, central program before being passed to another subroutine. However, the underlying logic of the model is clearer this way than it would be if the flowcharts showed the actual coding path.

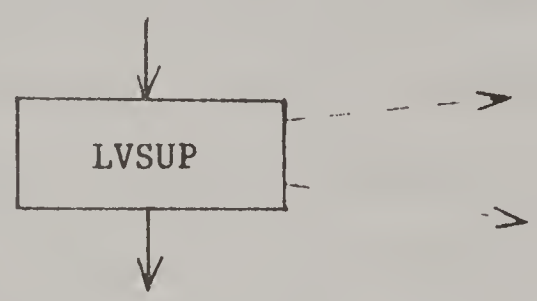
Subroutine calls are indicated by rectangular boxes, while other operations within subroutines are indicated by hexagons. The sequence of calls and operations is shown by solid arrows. For example,



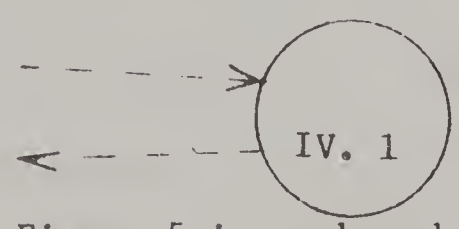
Decisions and branch points are shown by diamonds:



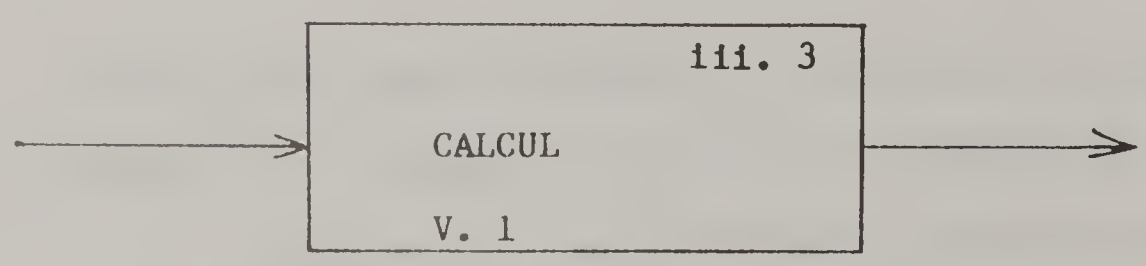
Transfer of control to and return from a subroutine are indicated by a dashed arrow. For example, for subroutine LVSUP:



where operations and calls within LVSUP would be shown between the transfer and return arrows. If they are not shown on the same chart, linkages to other charts are shown in circles at the head and tail of those arrows. That is,



Each chart in Figure 5 is numbered with a Roman numeral, and each subroutine box on a chart is numbered with an Arabic numeral in the upper right-hand corner. If the same subroutine is referenced in a box on other charts, the cross-references are shown in the lower left-hand corner. For example,



where CALCUL is the third box on the current chart (Chart III) and the first one on Chart V.

Finally, major control switches and parameters, which are read in on the

the above decision point illustration. These switches and parameters are defined and their use described in Chapter 4.

A note is in order here concerning block data subprograms, or, more appropriately, pseudo-subprograms. They are not actually implemented during program execution but rather at program load. They are nevertheless shown in the charts to indicate data input associated with particular model components.

These charts should be read in conjunction with the subroutine definitions listed in the next section of this chapter. These definitions describe the principal functions of each subroutine and function subprogram and indicate where each is called from and what other subroutines it calls.

The charts and definitions are organized by major program section, and the definitions are alphabetical by subroutine name within each section. Four sections are identified. The IIASA section (Charts I to IX) includes a) the executive superstructure which the country models plug into, and b) the international and domestic equilibrium algorithms. The remaining sections cover the U.S. detailed model (Charts X to XX), the U.S. basic (intermediate) model (Charts XXI to XXII) and the other basic country models (Charts XXIII to XXXII), respectively.

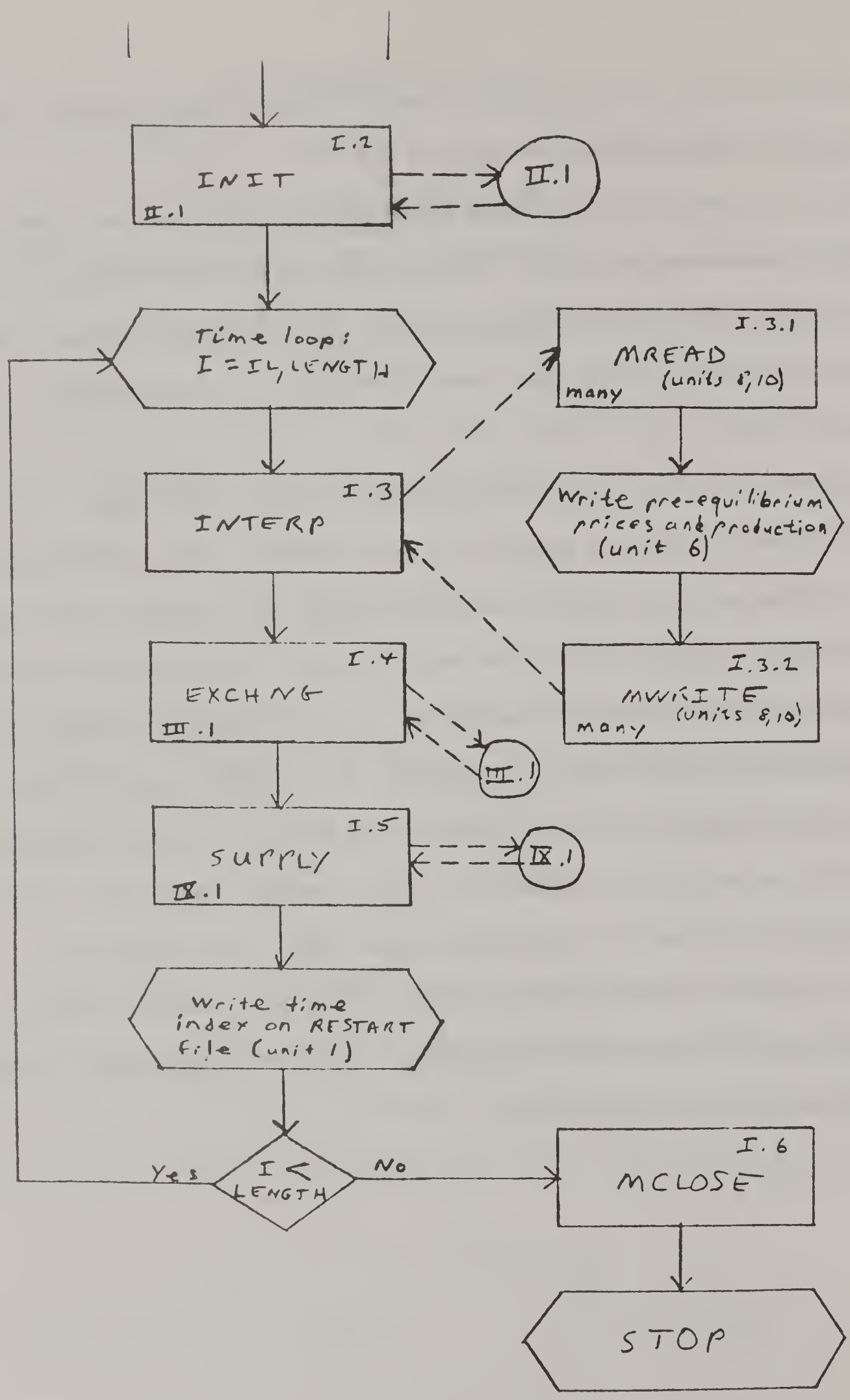


Figure 5
USWRLD Flow Charts and Call Sequences

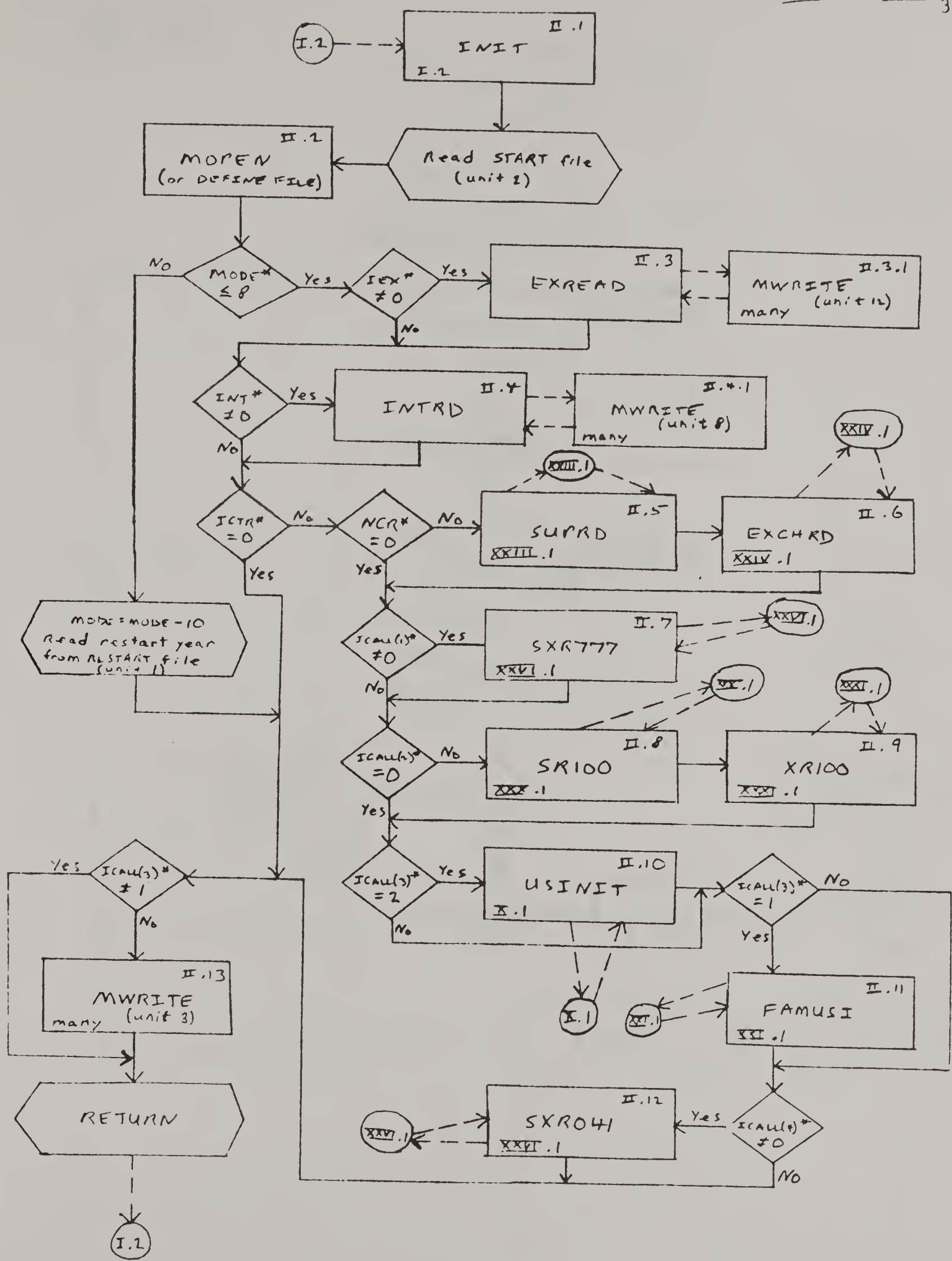

I.2
II.1
INIT
I.2
II.2
MOPEN
(or DEFINE FILE)
Read START file
(unit 2)
MODE*
≤ 8
No
Yes
IEX*
≠ 0
Yes
No
II.3
EXREAD
II.3.1
MWRITE
(unit 12)
many
INT*
≠ 0
Yes
No
II.4
INTRD
II.4.1
MWRITE
(unit 8)
many
XXIV.1
XXIII.1
ICTR*
= 0
No
Yes
NCR*
= 0
No
Yes
II.5
SUPRD
XXIII.1
II.6
EXCHRD
XXIV.1
ICALL(1)*
≠ 0
Yes
No
II.7
SXR777
XXVI.1
XXVI.1
XX.1
XXI.1
ICALL(2)*
= 0
No
Yes
II.8
SR100
XXX.1
II.9
XR100
XXXI.1
ICALL(3)*
= 2
Yes
No
II.10
USINIT
X.1
ICALL(3)*
= 1
No
Yes
II.11
FAMUSI
XXI.1
X.1
XX.1
ICALL(4)*
≠ 0
Yes
No
II.12
SXR041
XXVI.1
XXV.1
ICALL(3)*
≠ 1
Yes
No
II.13
MWRITE
(unit 3)
many
RETURN
I.2
MODE = MODE - 10
Read restart year
from RESTART file
(unit 1)

Fig. 5 (cont'd.)
Chart III

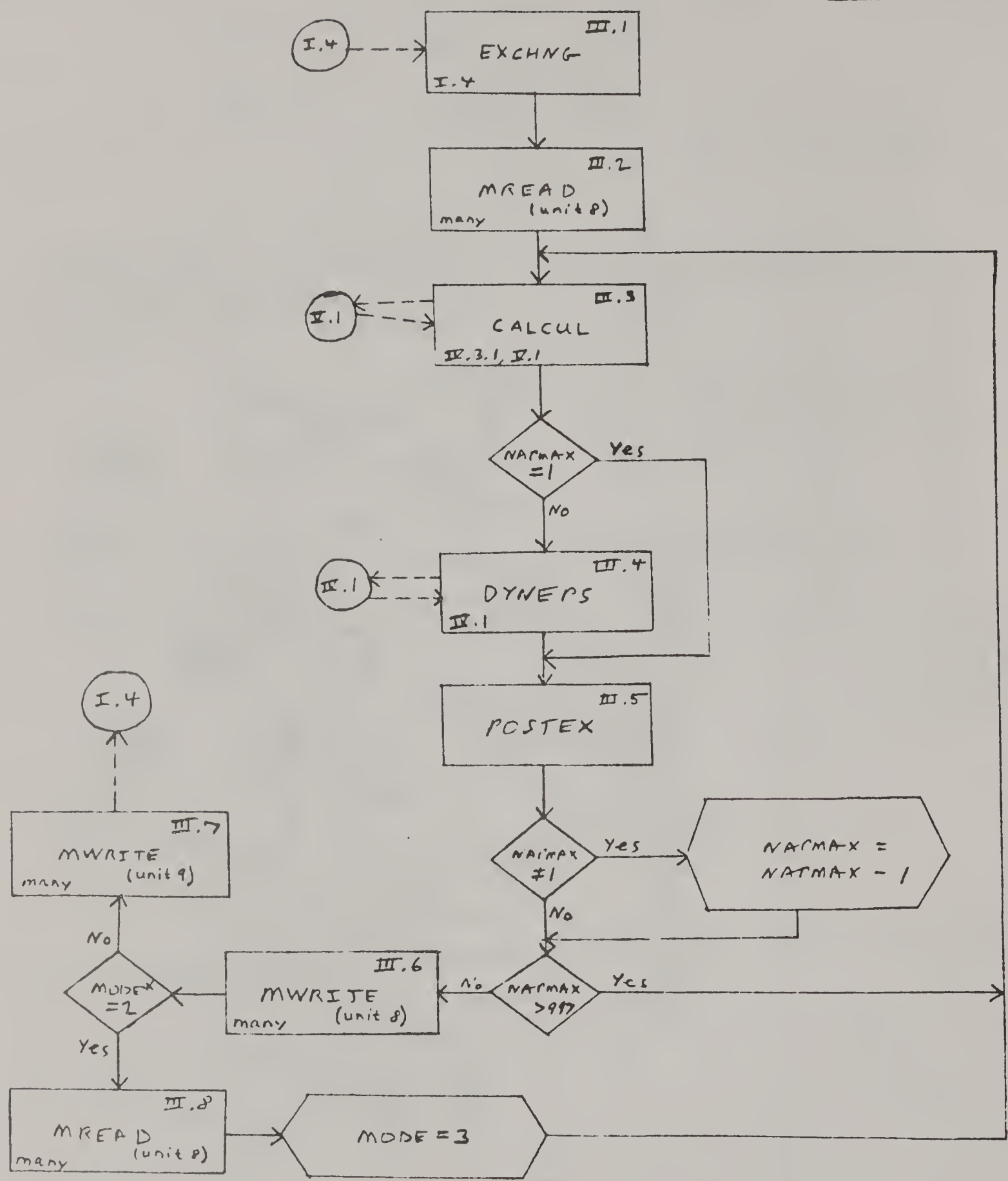


FIG. 5 (cont, d.)
CHART IV

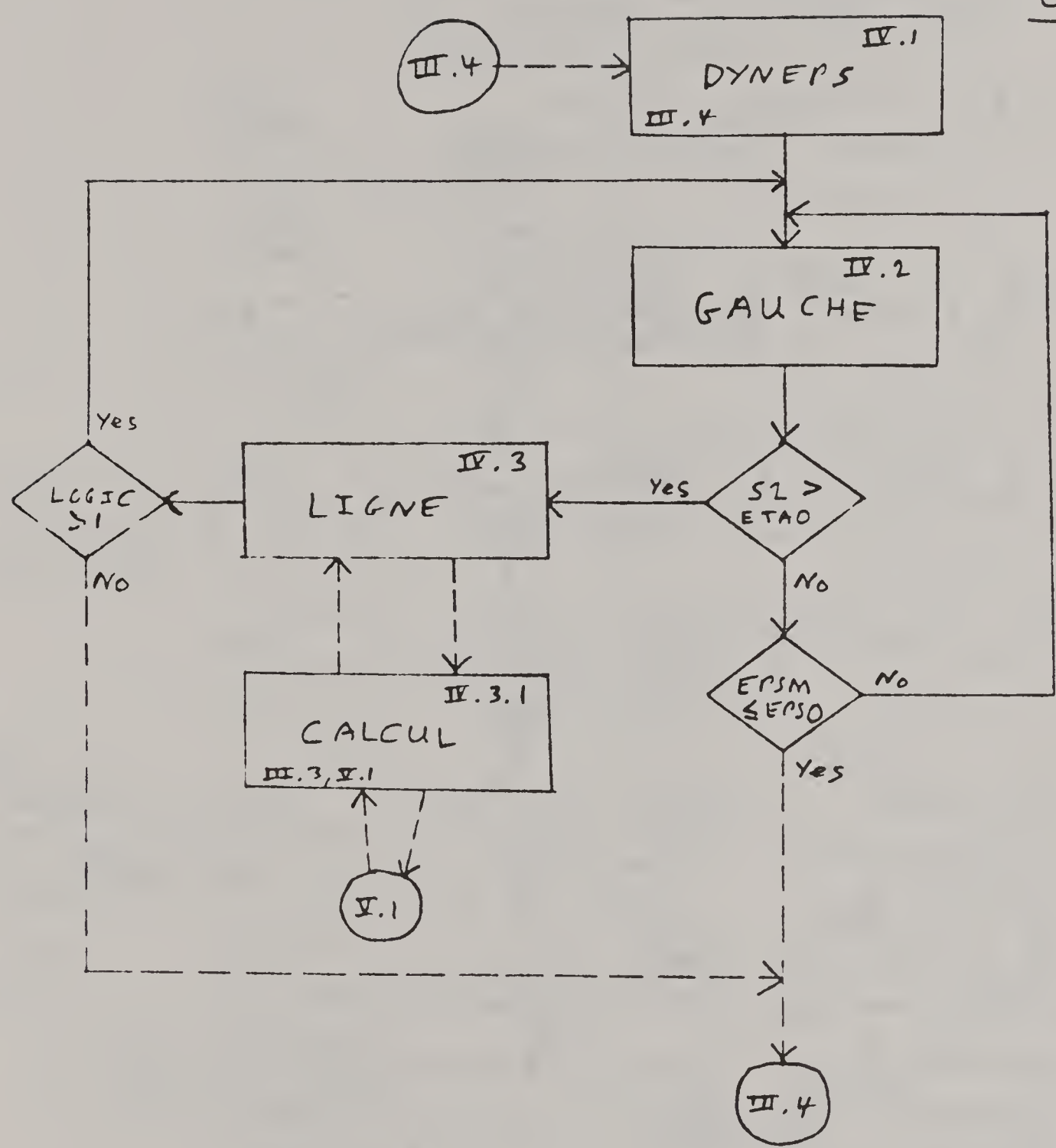
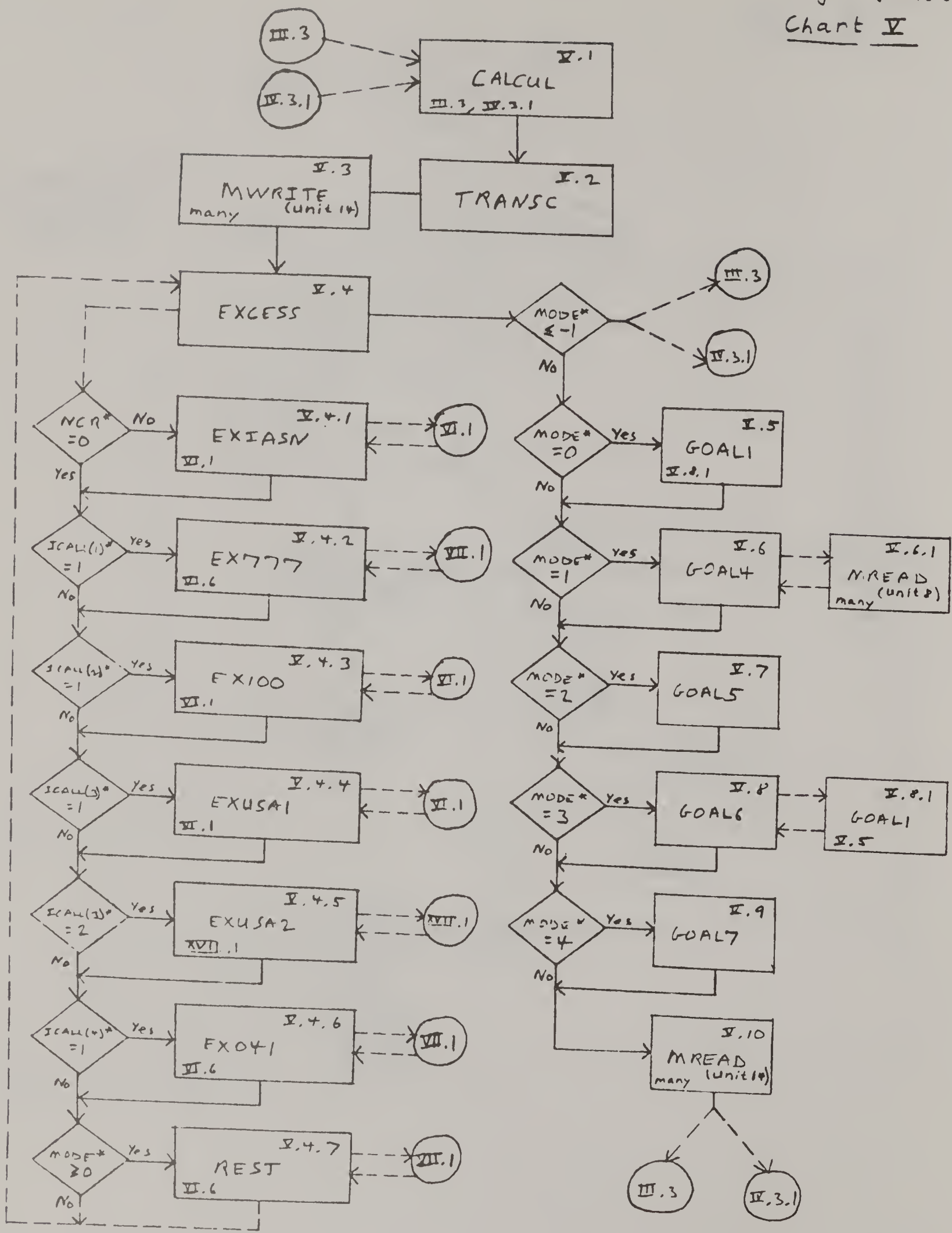


Fig. 5 (cont'd.)

Chart V



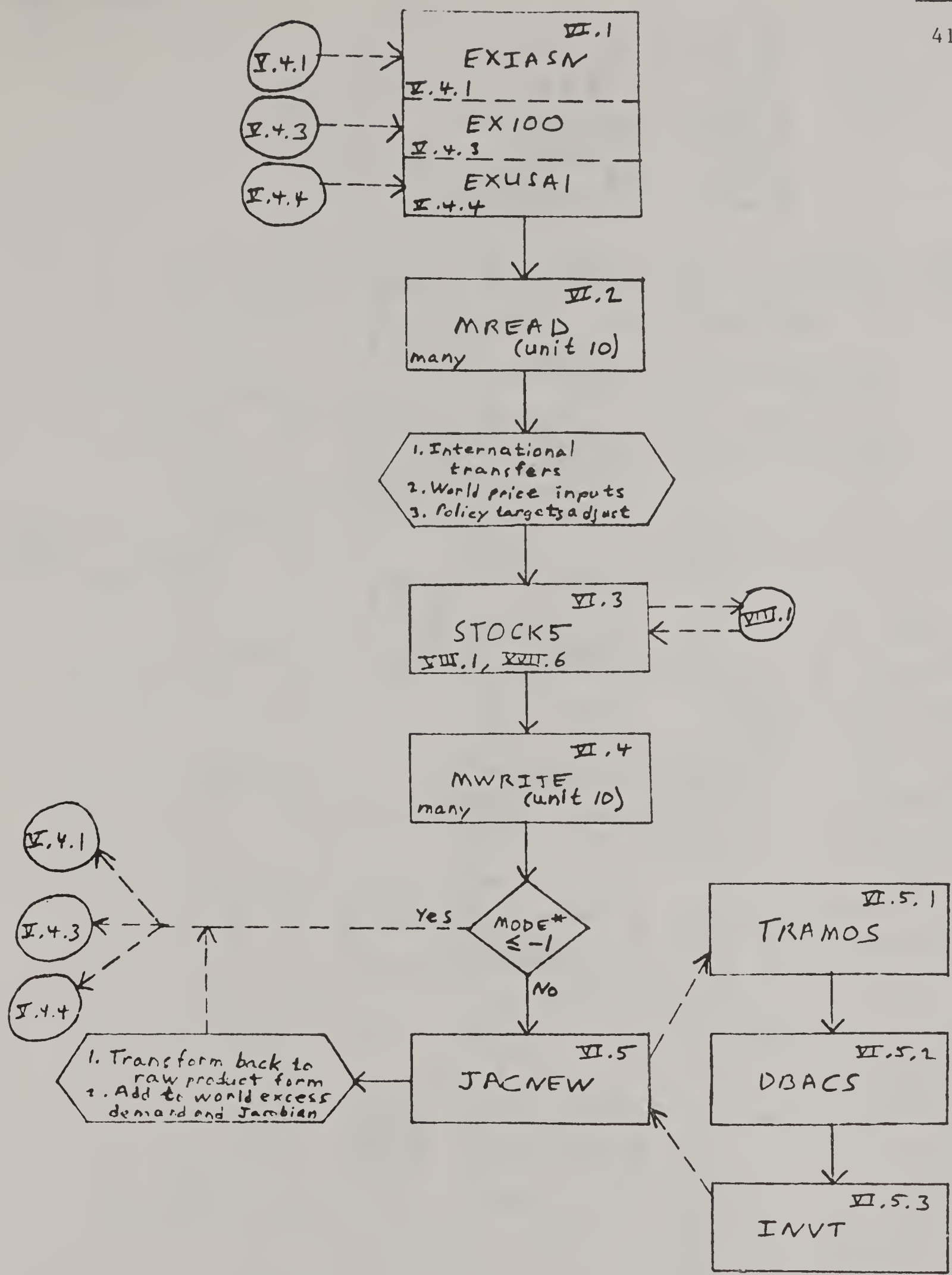

VI.1
EXIASN
V.4.1
EX100
V.4.3
EXUSAI
V.4.4
V.4.1
V.4.3
V.4.4
VI.2
MREAD
(unit 10)
many
1. International transfers
2. World price inputs
3. Policy targets adjust
VI.3
STOCK5
VIII.1, XVII.6
VIII.1
VI.4
MWRITE
(unit 10)
many
V.4.1
V.4.3
V.4.4
Yes
MODE*
≤ -1
No
VI.5.1
TRAMOS
VI.5.2
DBACS
VI.5.3
INVT
VI.5
JACNEW
1. Transform back to raw product form
2. Add to world excess demand and Jambian

Fig. 5 (cont'd.)
Chart VII

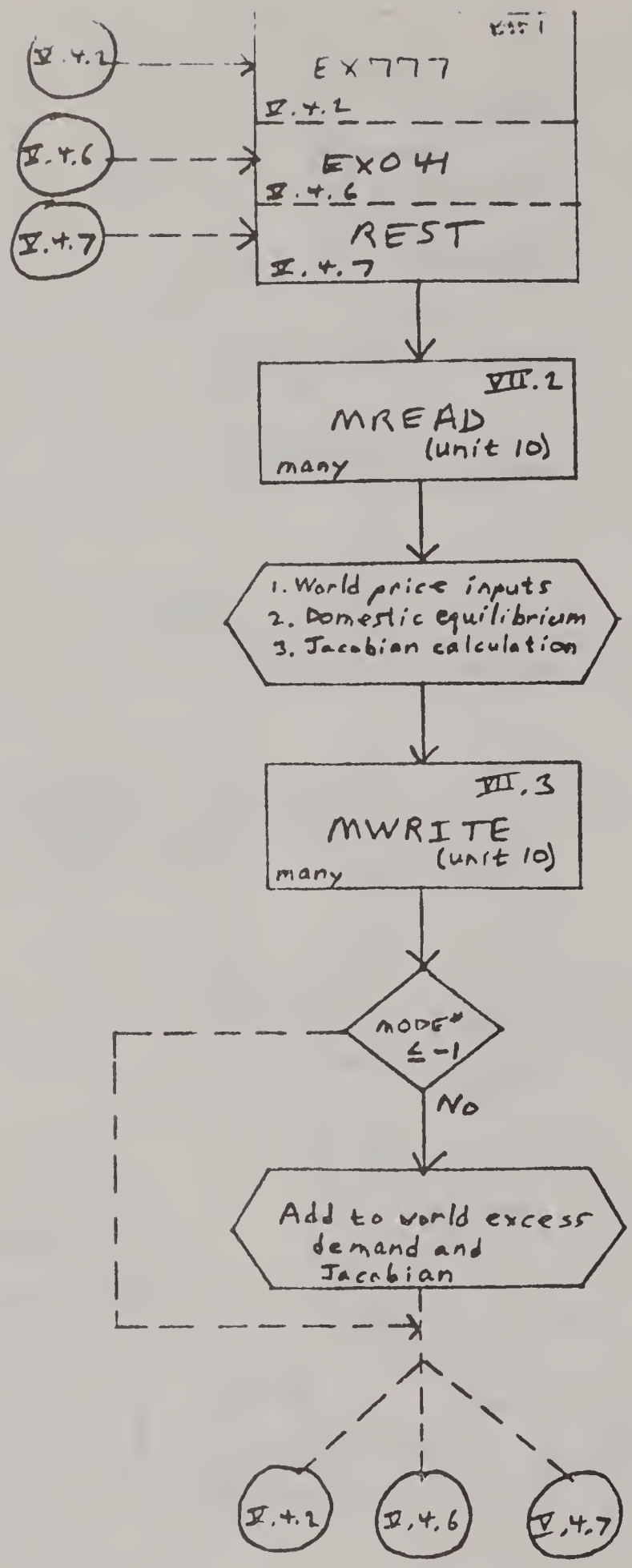


Fig. 5 (cont'd.

Chart VIII

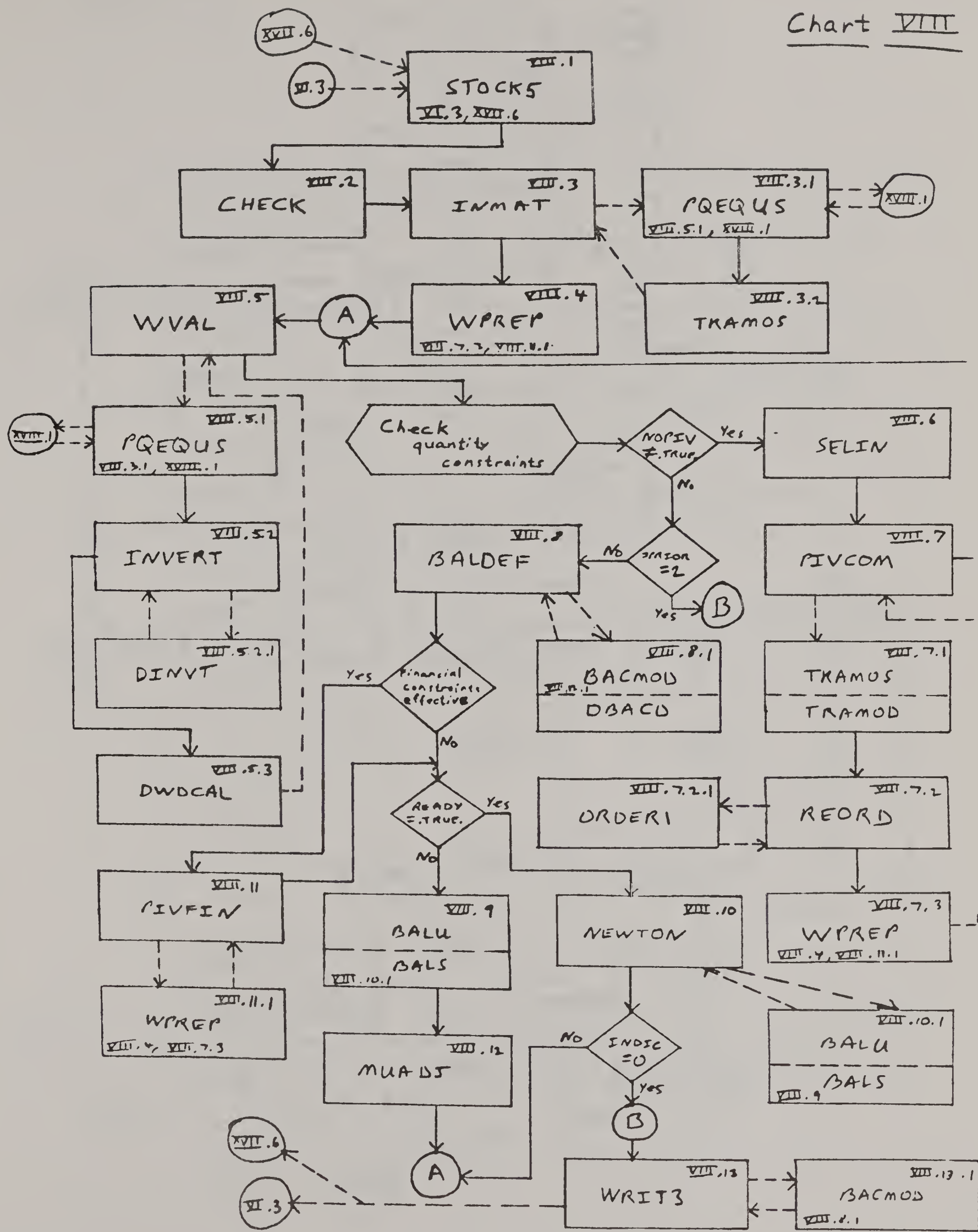


Chart IX

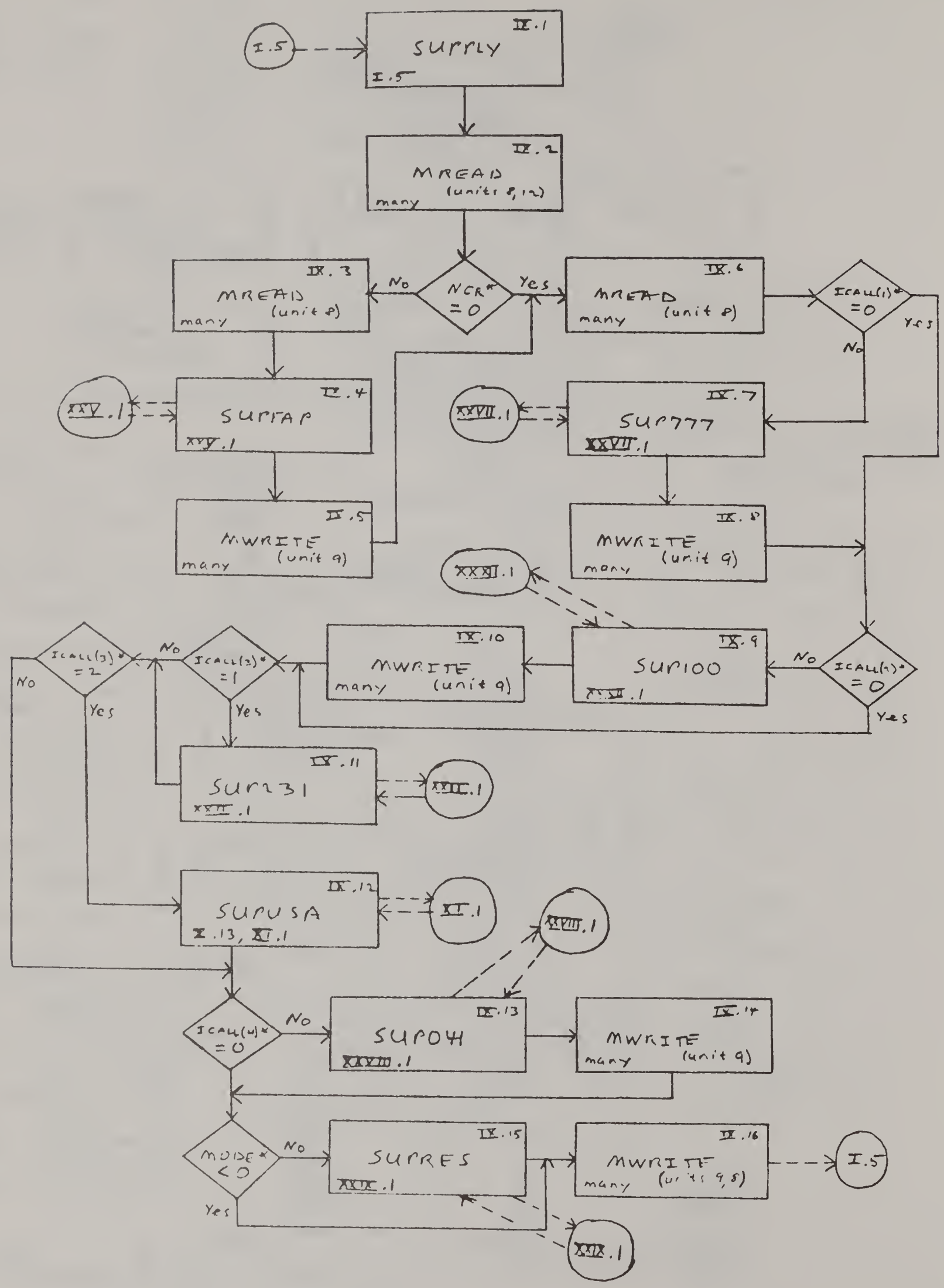

I.5
IX.1
SUPPLY
I.5
IX.2
MREAD
(units 8, 12)
many
IX.3
MREAD
(unit 8)
many
No
NCR*
=0
Yes
IX.6
MREAD
(unit 8)
many
ICALL(1)*
=0
Yes
No
XXV.1
IX.4
SUPTAP
XXV.1
XXVII.1
IX.7
SUP777
XXVII.1
IX.5
MWRITE
(unit 9)
many
IX.8
MWRITE
(unit 9)
many
XXXI.1
IX.10
MWRITE
(unit 9)
many
IX.9
SUP100
XXXI.1
No
ICALL(1)*
=0
Yes
ICALL(3)*
=2
No
Yes
No
ICALL(3)*
=1
Yes
IX.11
SUP231
XXXII.1
XXXIII.1
IX.12
SUPUSA
X.13, XI.1
XI.1
XXVIII.1
ICALL(4)*
=0
No
IX.13
SUP04H
XXVIII.1
IX.14
MWRITE
(unit 9)
many
MODE*
<0
No
IX.15
SUPRES
XXIX.1
IX.16
MWRITE
(units 9, 8)
many
I.5
Yes
XXIX.1

FIG. 5 (cont'd.)

CHART X

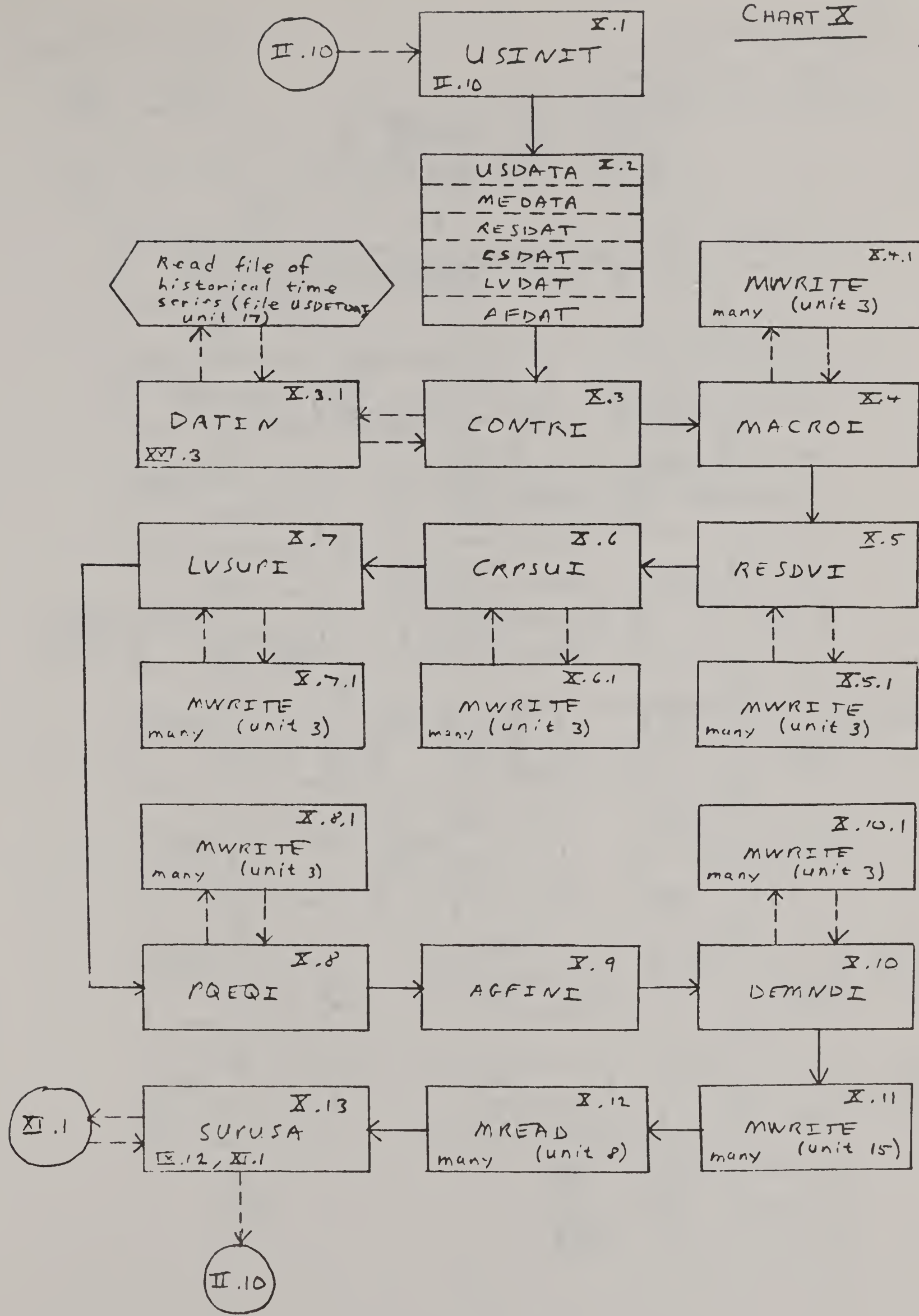


Fig. 5 (cont'd.)

Chart XI

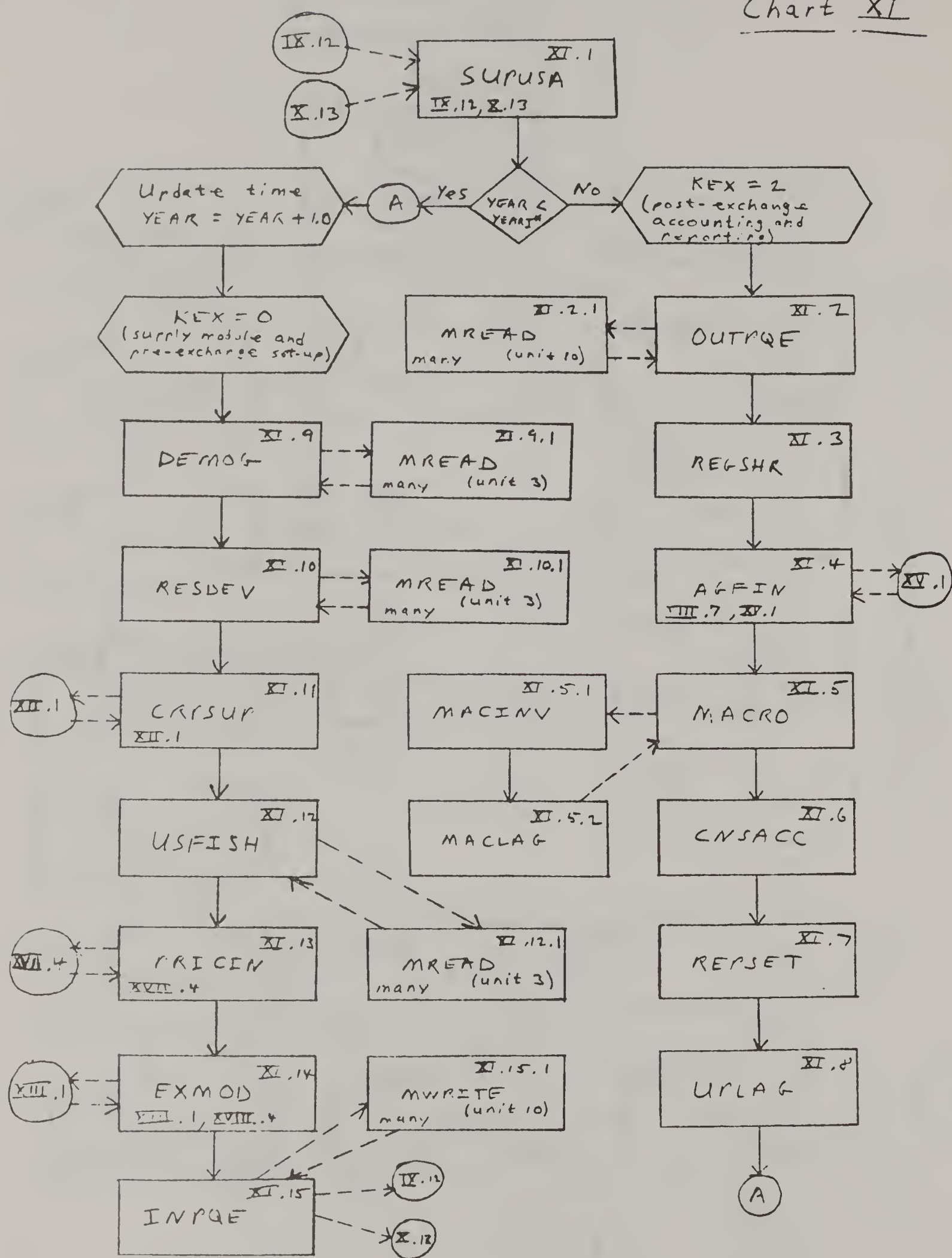


Fig. 5 (cont.)

Chart XII

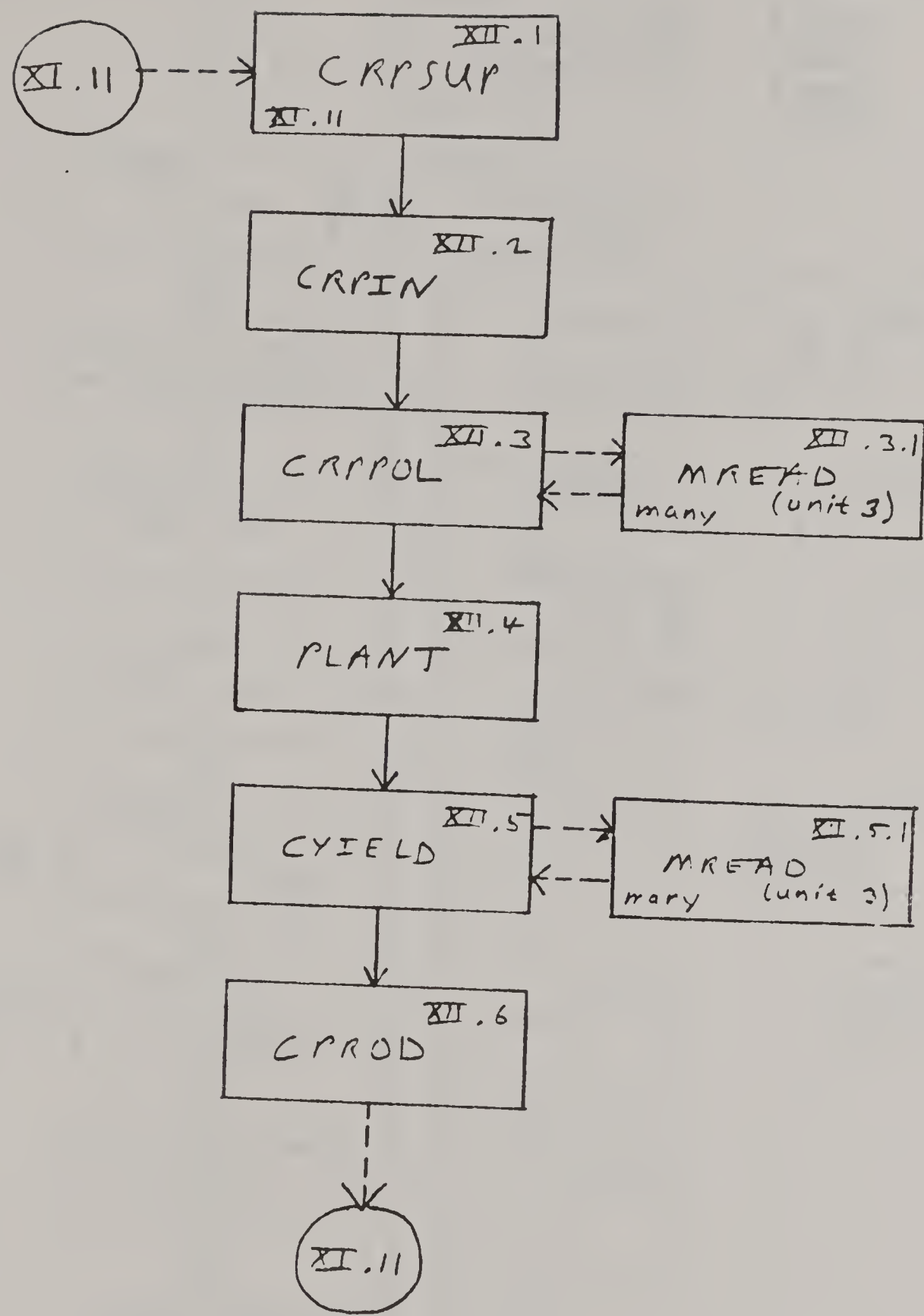


Chart XIII

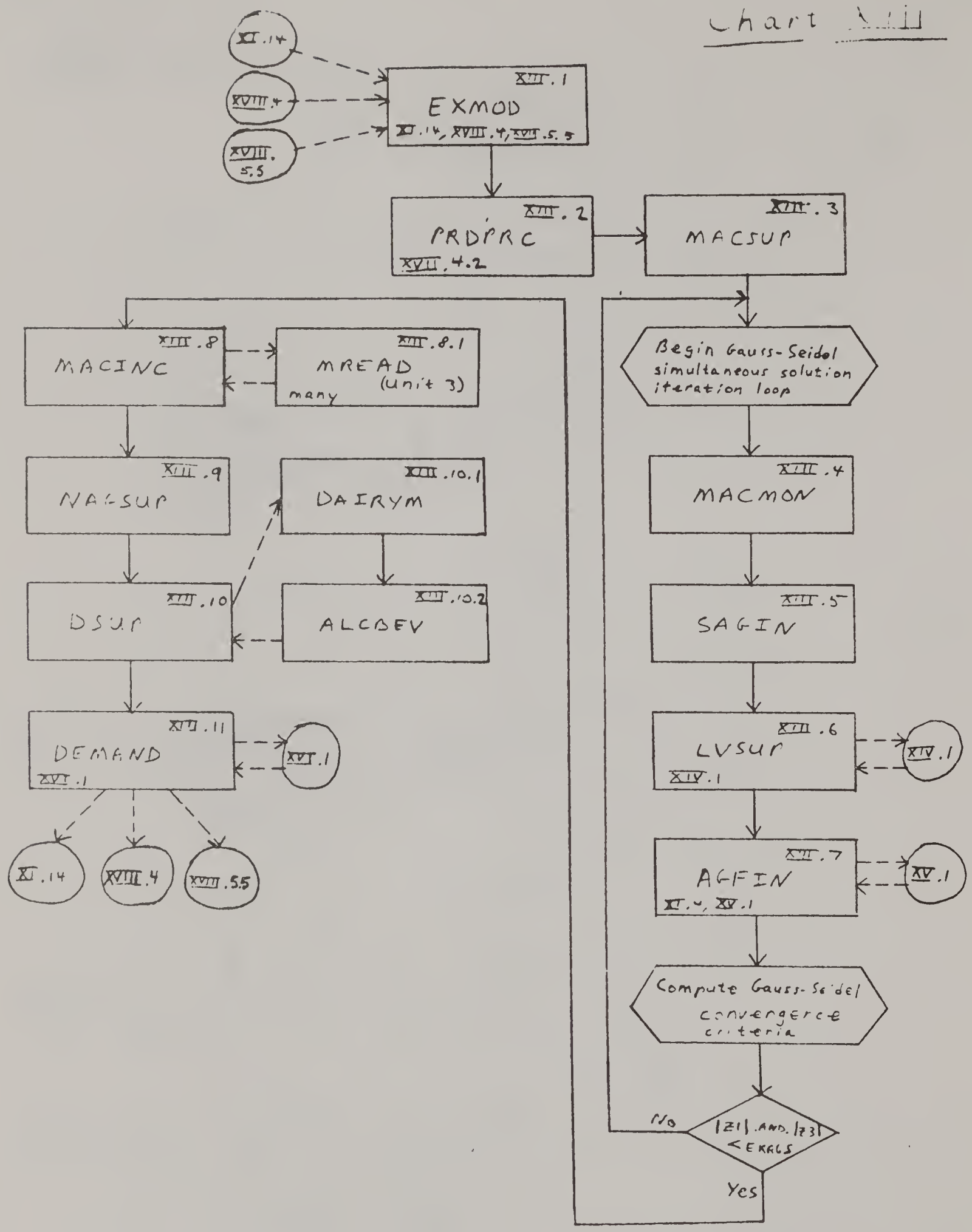

XI.14
XVIII.4
XVIII.5.5
XIII.1
EXMOD
XI.14, XVIII.4, XVII.5.5
XIII.2
PRDPRC
XVII.4.2
XIII.3
MACSUP
XIII.8
MACINC
XIII.8.1
MREAD
(Unit 3)
many
Begin Gauss-Seidel simultaneous solution iteration loop
XIII.9
NACSUP
XIII.10.1
DAIRYM
XIII.4
MACMON
XIII.10
DSUP
XIII.10.2
ALCBEV
XIII.5
SAGIN
XIII.11
DEMAND
XVI.1
XVI.1
XIII.6
LVSUP
XIV.1
XIV.1
XI.14
XVIII.4
XVIII.5.5
XIII.7
AGFIN
XI.4, XV.1
XV.1
Compute Gauss-Seidel convergence criteria
No
|Z1| .AND. |Z3| < EKALS
Yes

Fig. 5 (cont'd)

Chart XIV

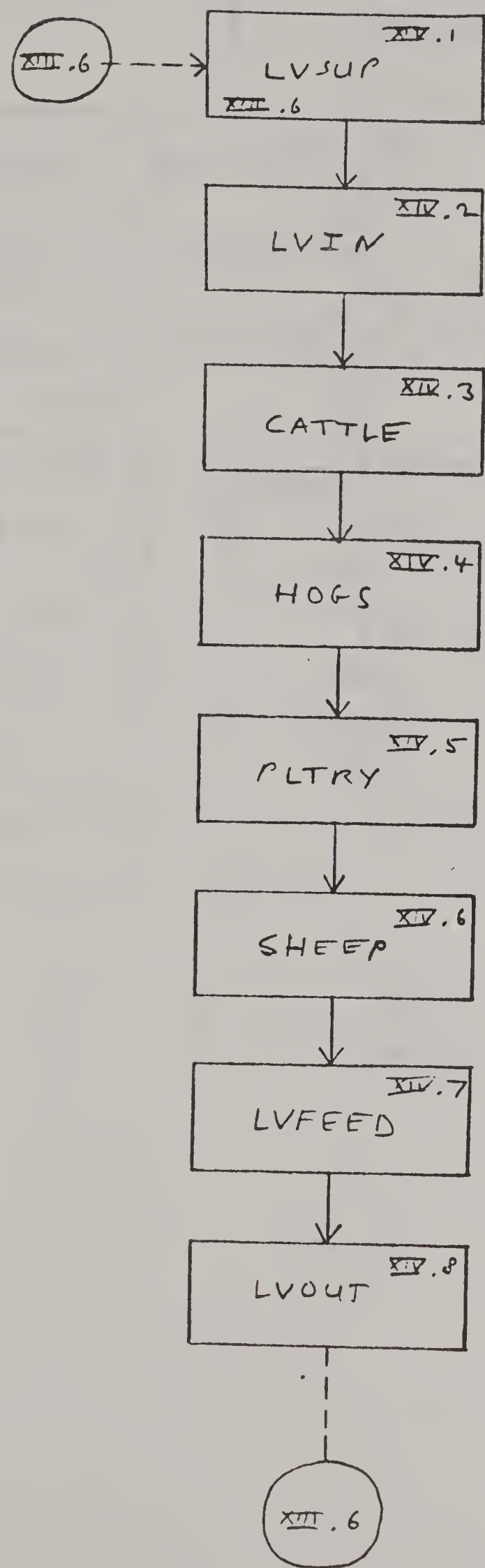


Fig. 5 (cont

Chart XV

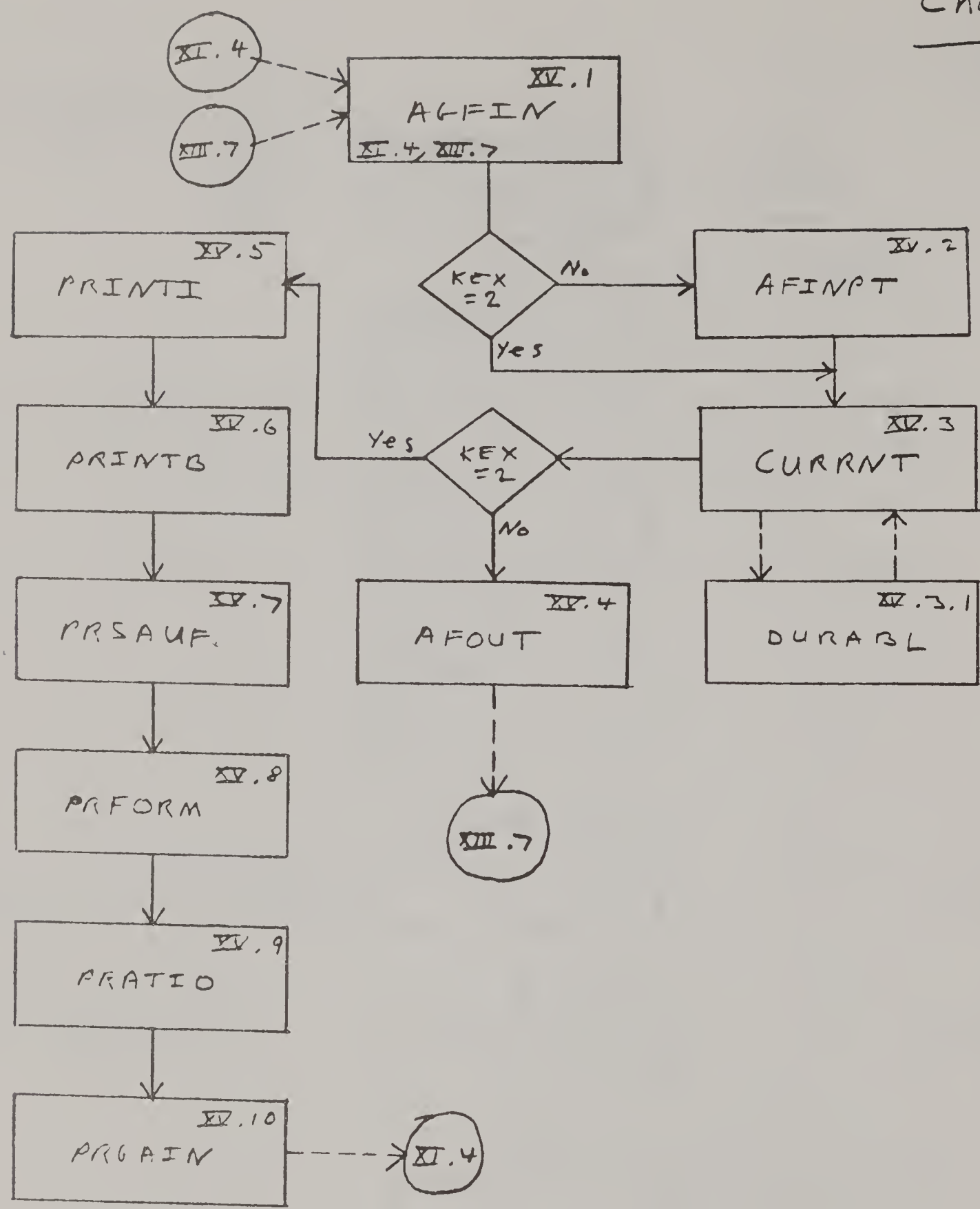
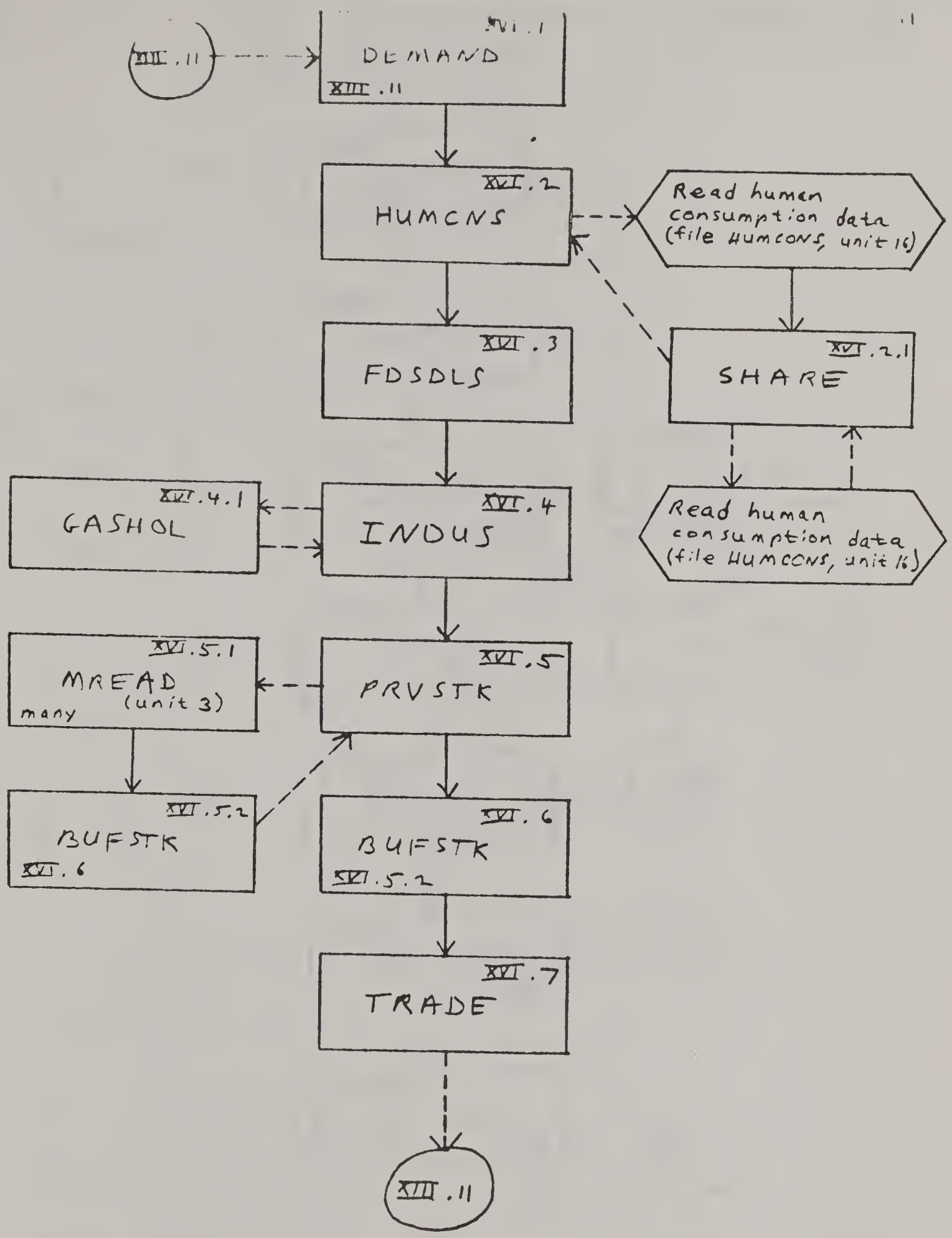


Fig. 5 (cont'd.)

Chart XI



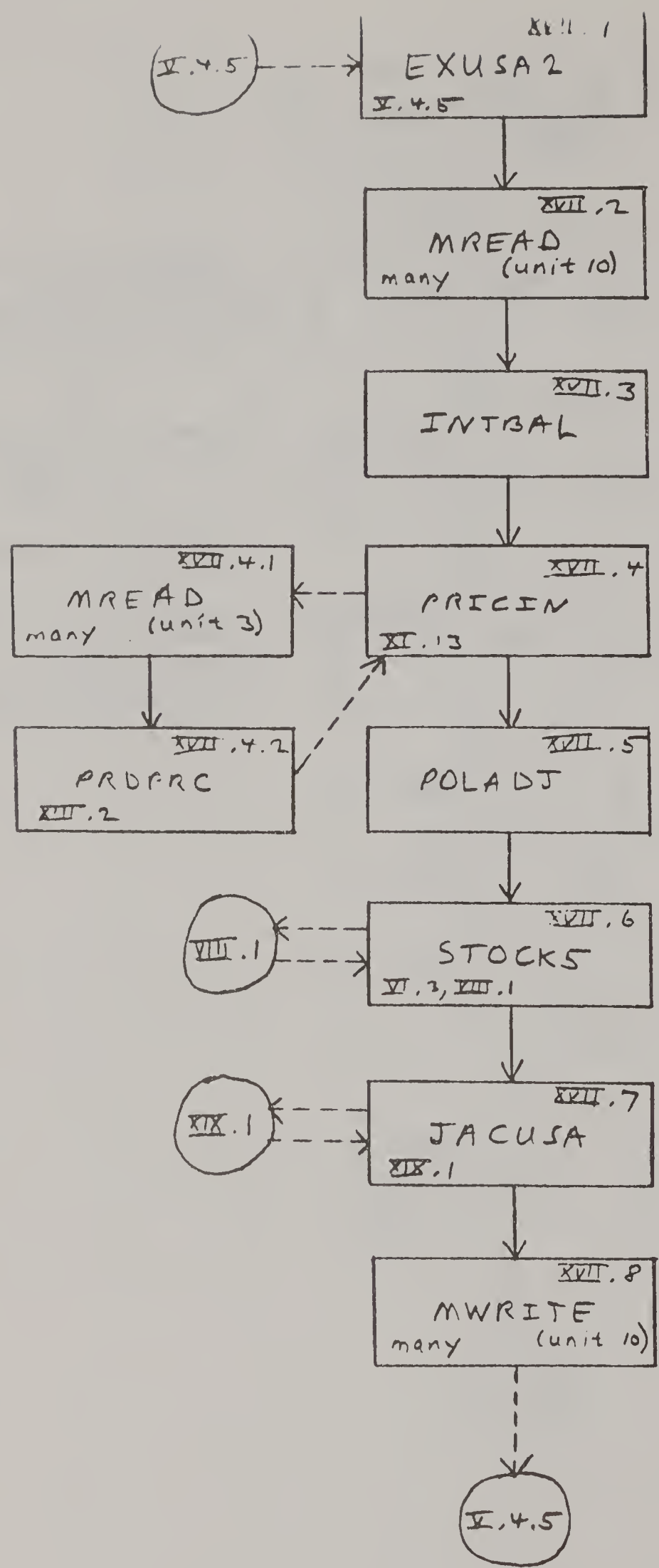

V.4.5
EXUSA2
V.4.5
XVII.2
MREAD
many
(unit 10)
XVII.3
INTBAL
XVII.4.1
MREAD
many
(unit 3)
XVII.4
PRICIN
XI.13
XVII.4.2
PRDPRC
XII.2
XVII.5
POLADJ
VIII.1
XVII.6
STOCKS
VI.3, VIII.1
XIX.1
XVII.7
JACUSA
XIX.1
XVII.8
MWRITE
many
(unit 10)
V.4.5

FIG. 5 (cont'd.)
CHART XVIII

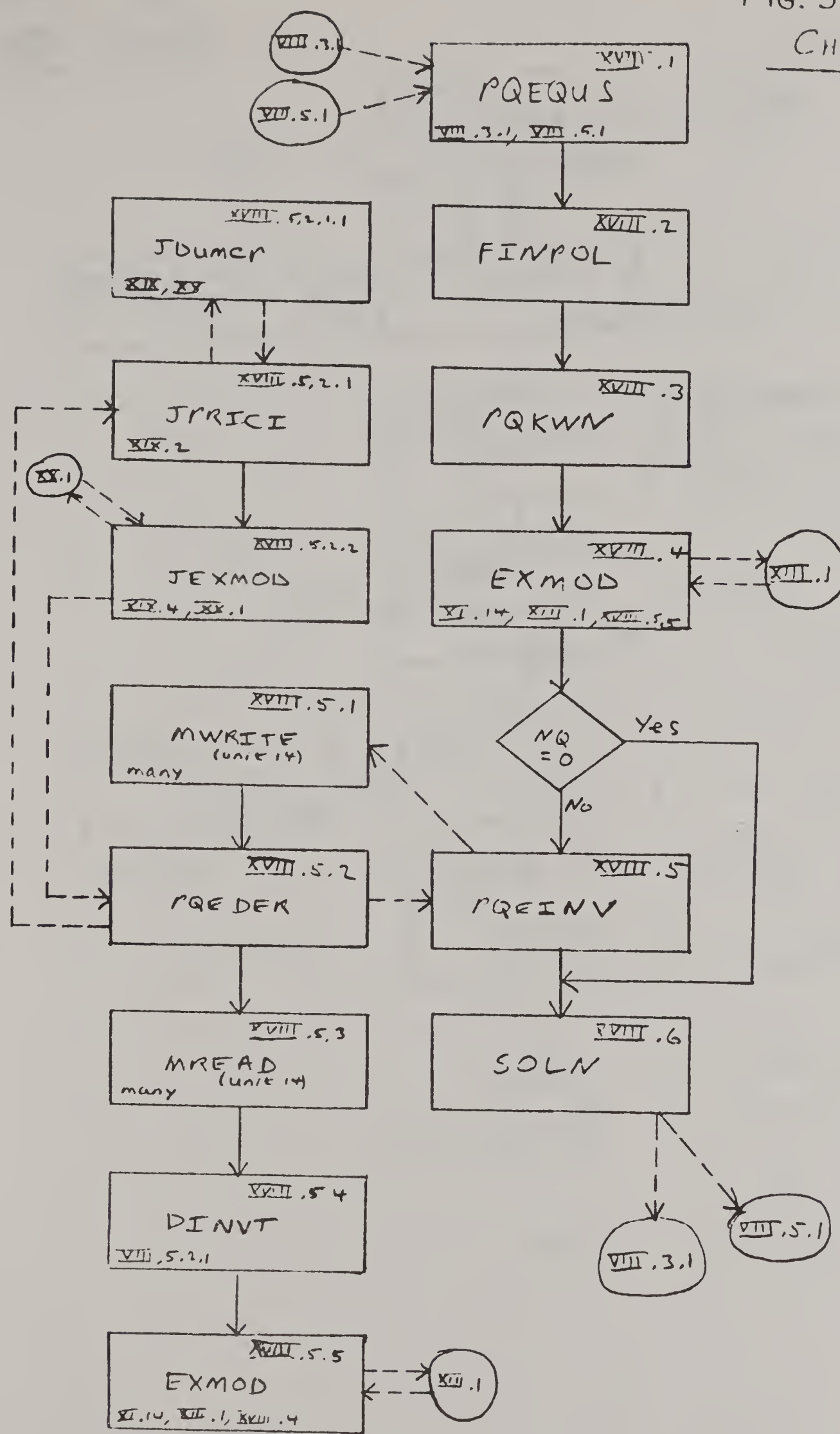


Fig. 5 (cont'd.)

Chart XIX

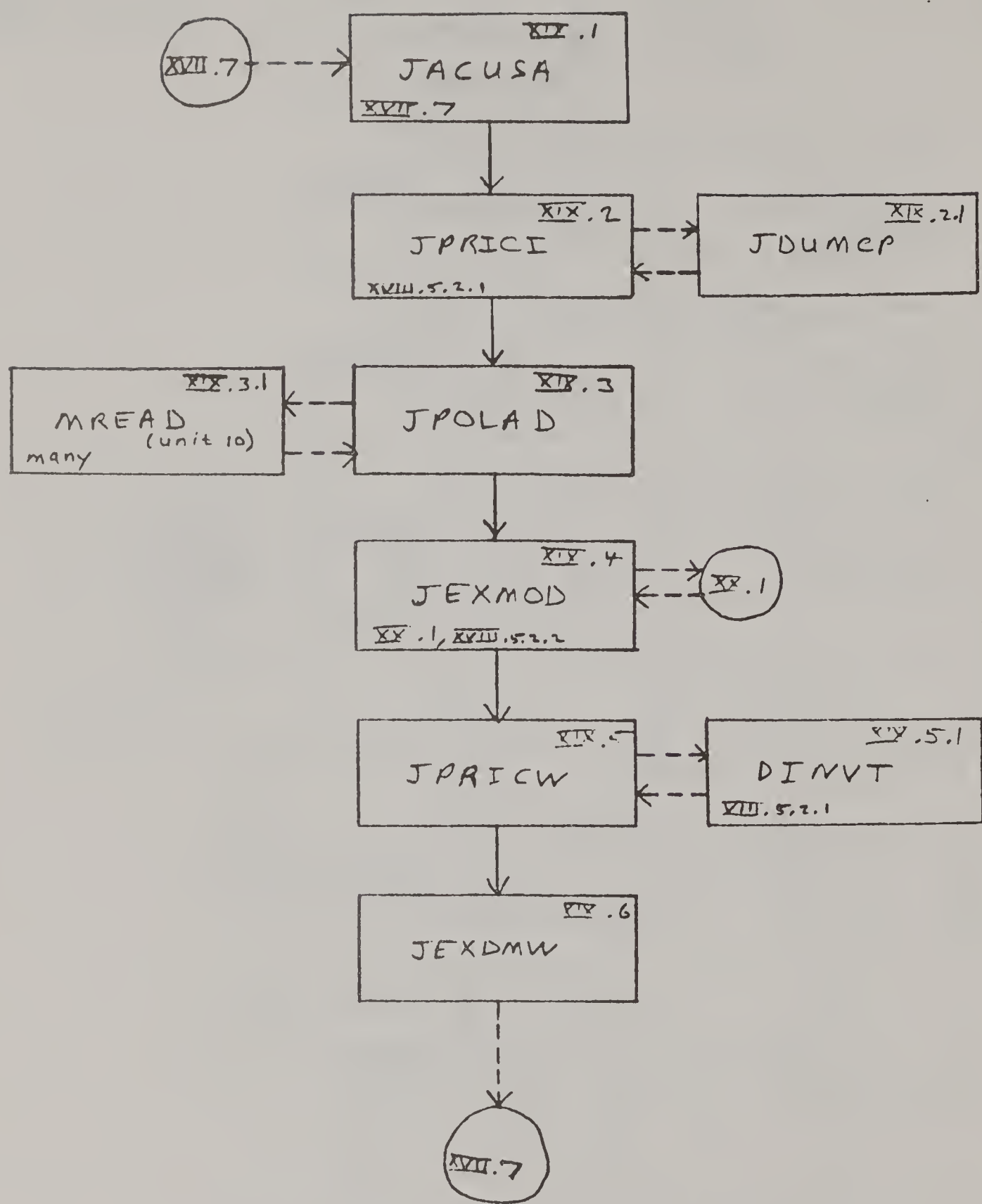


Fig. 5 (cont'd.)

Chart XX

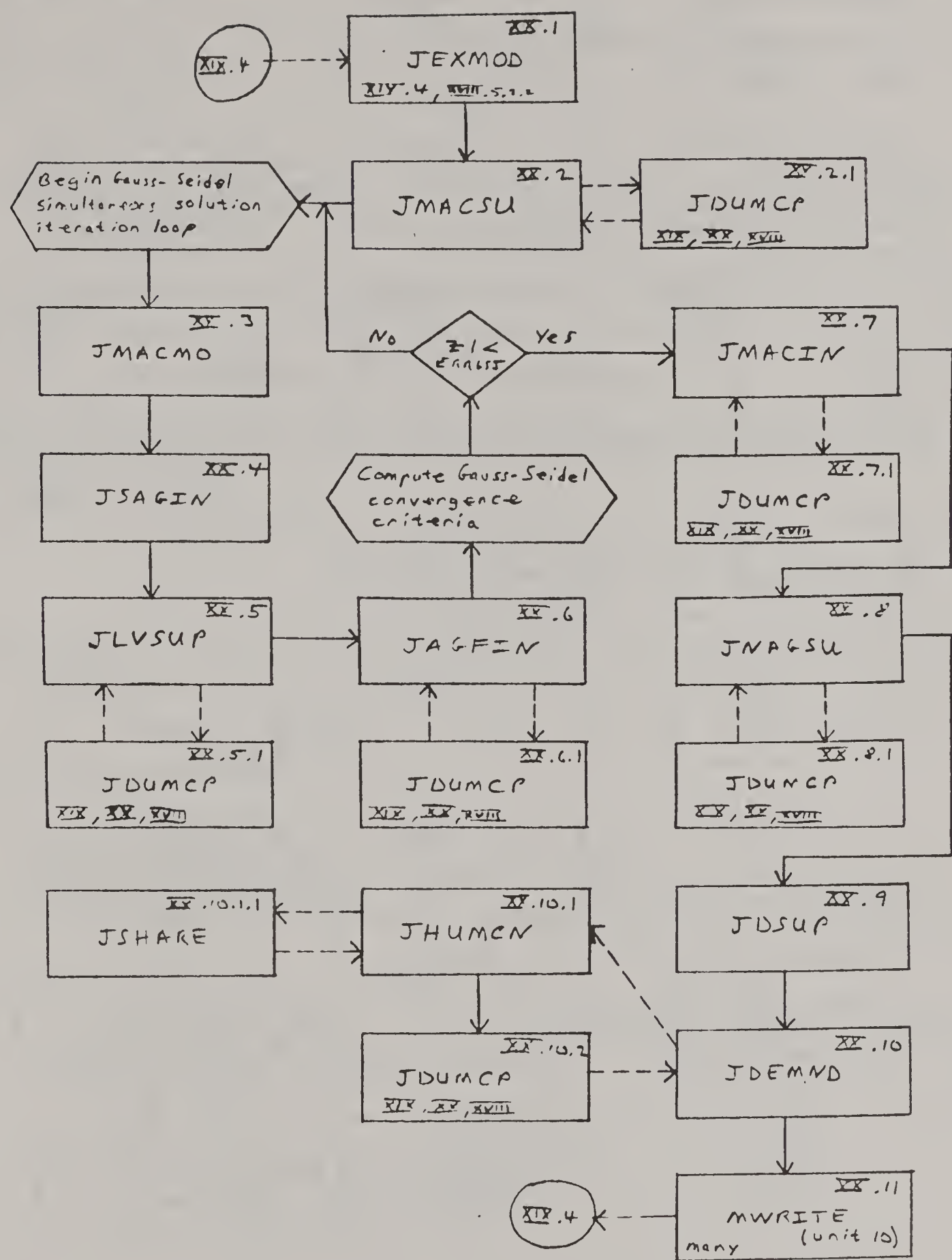


Fig. 5 (cont'd)

Chart XXI

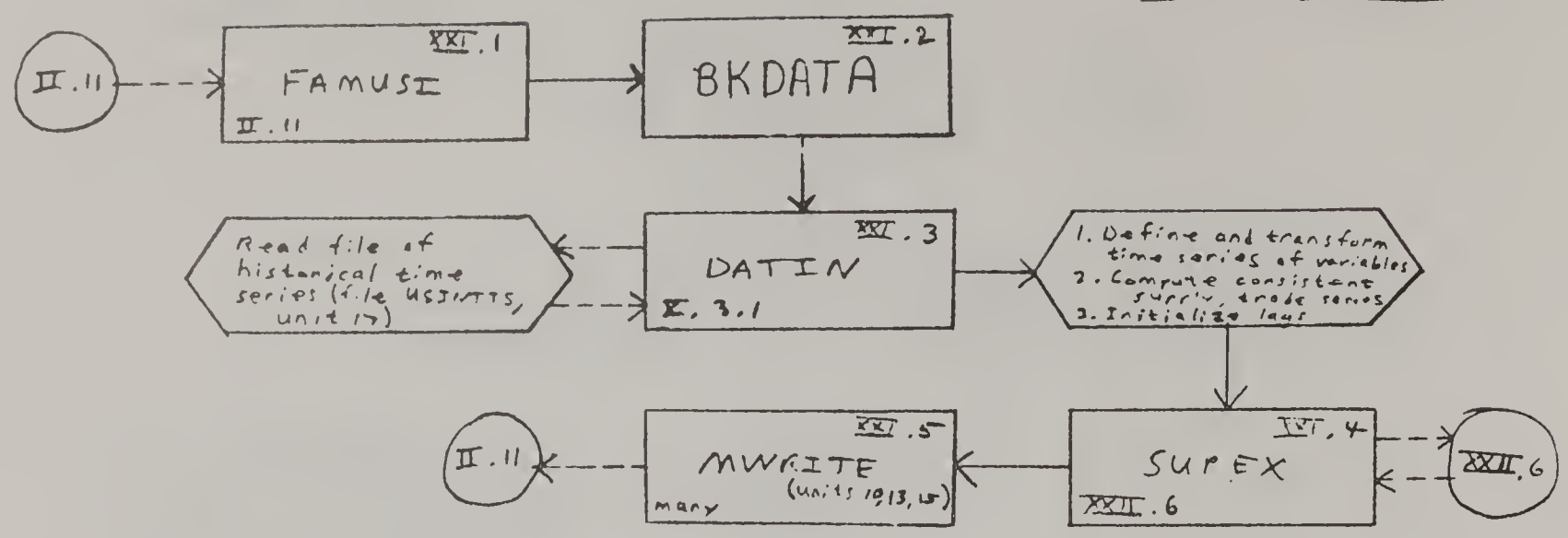


Chart XXII

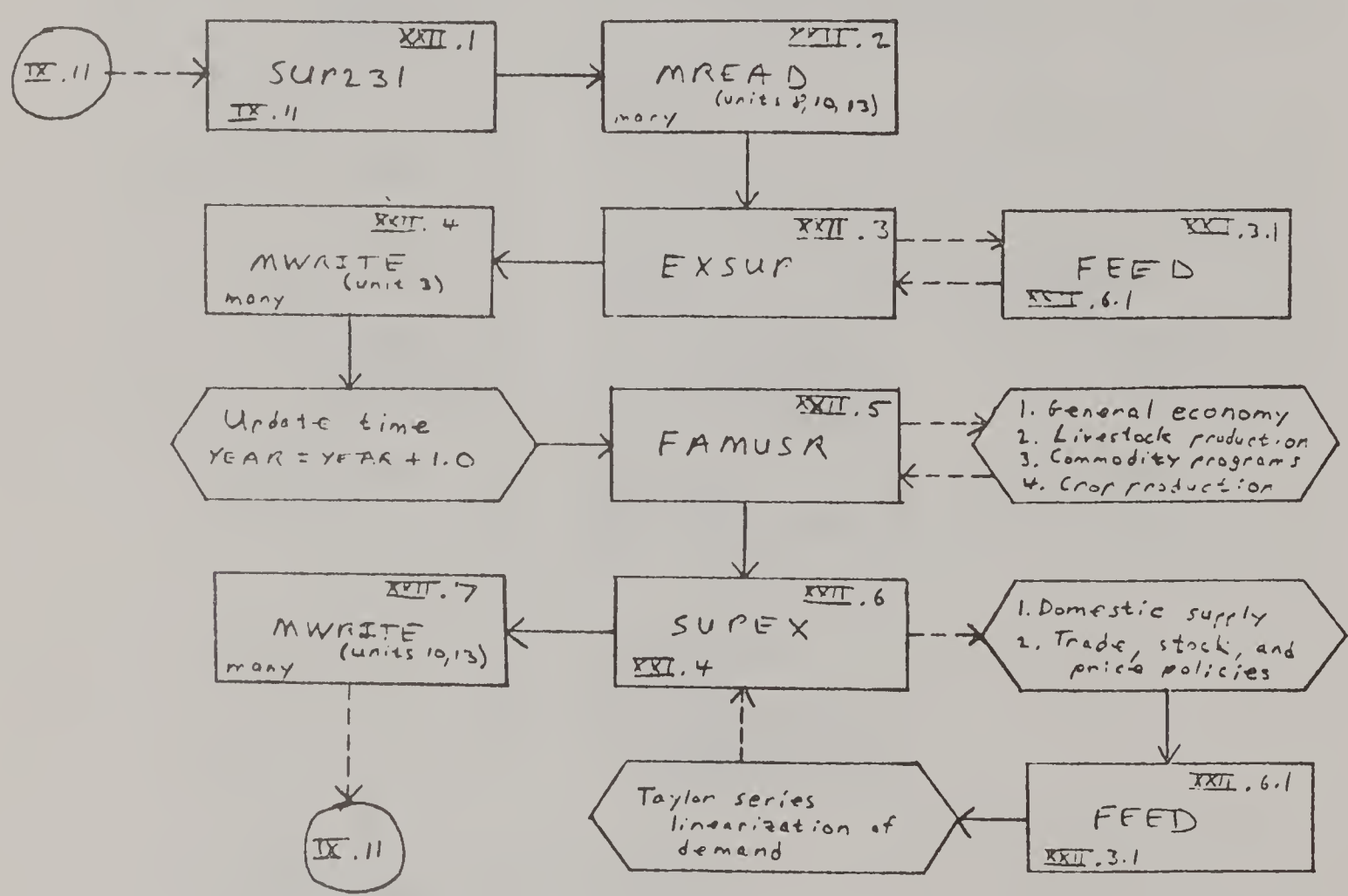


Fig. 5 (cont'd)

Chart XXIII

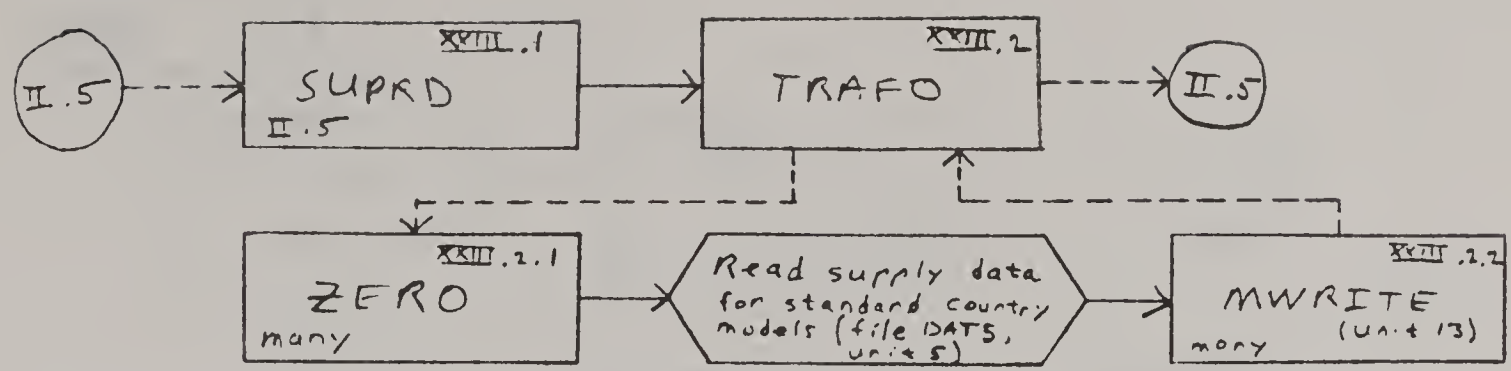


Chart XXIV

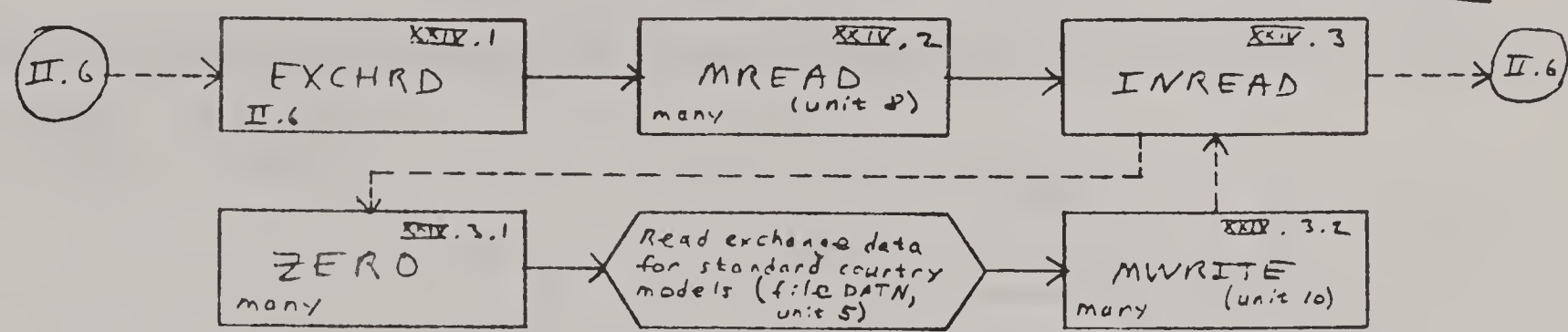


Chart XXV

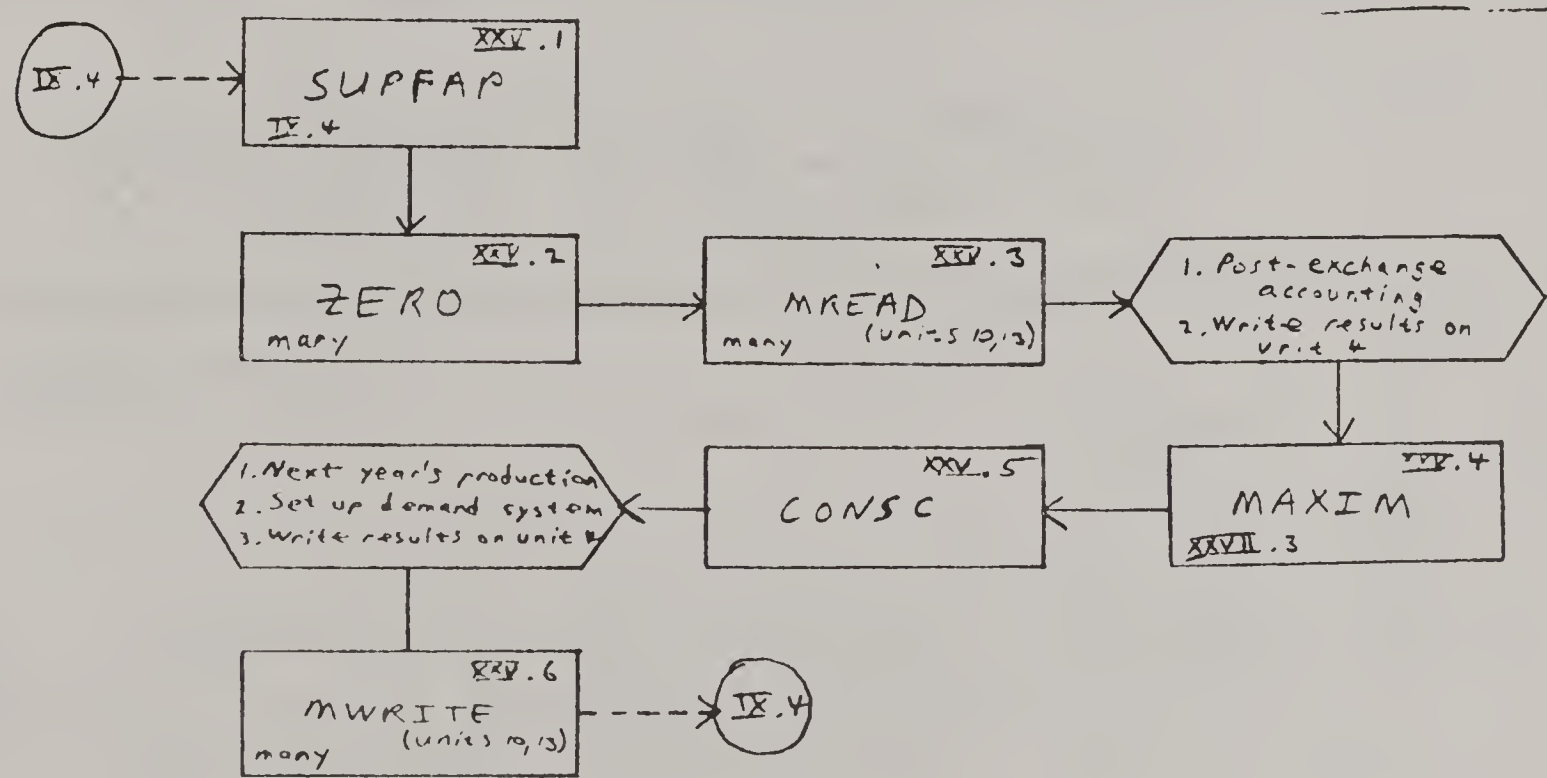


Fig. 5 (cont'd.)

Chart XXVI

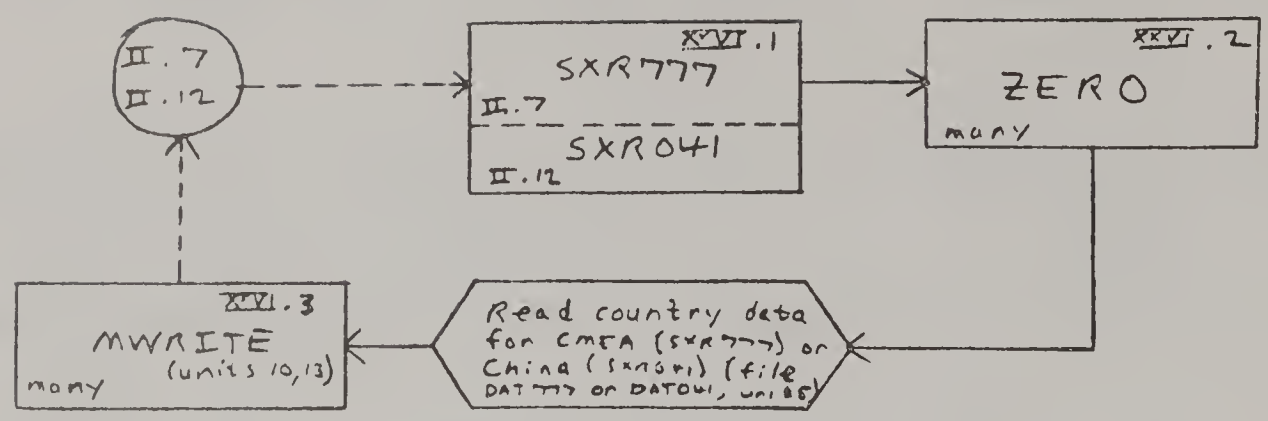


Chart XXVII

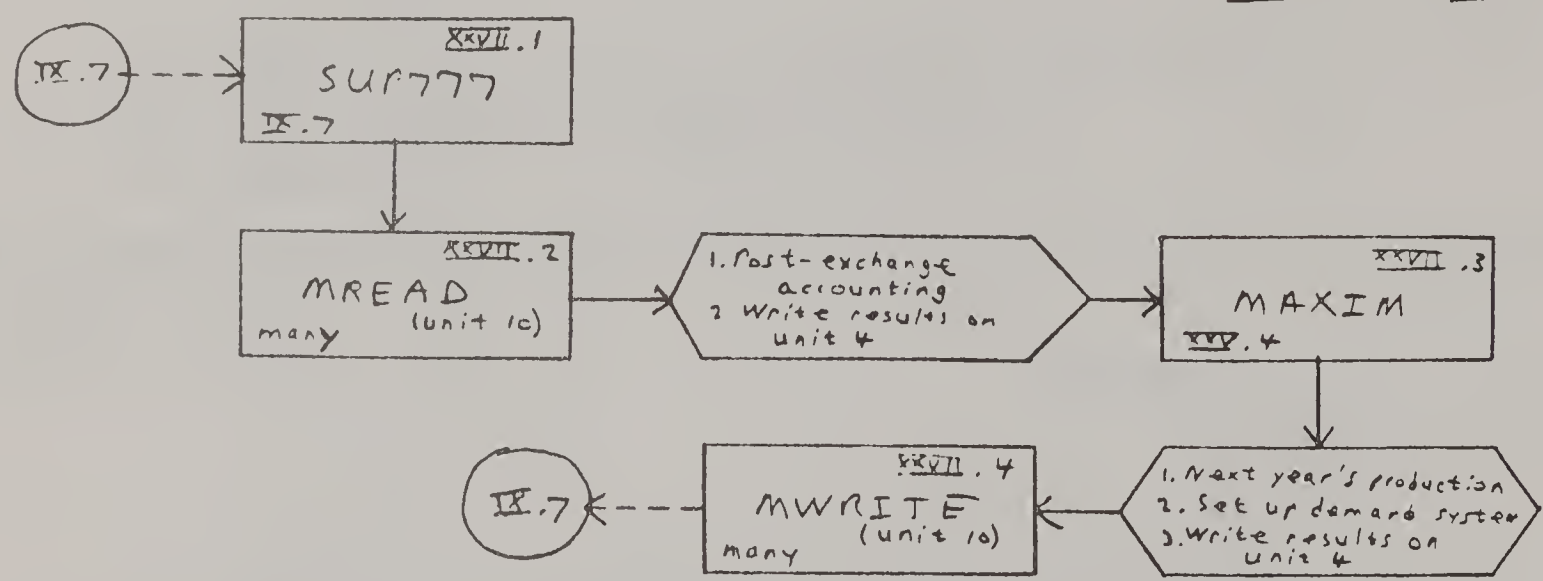


Chart XXVIII

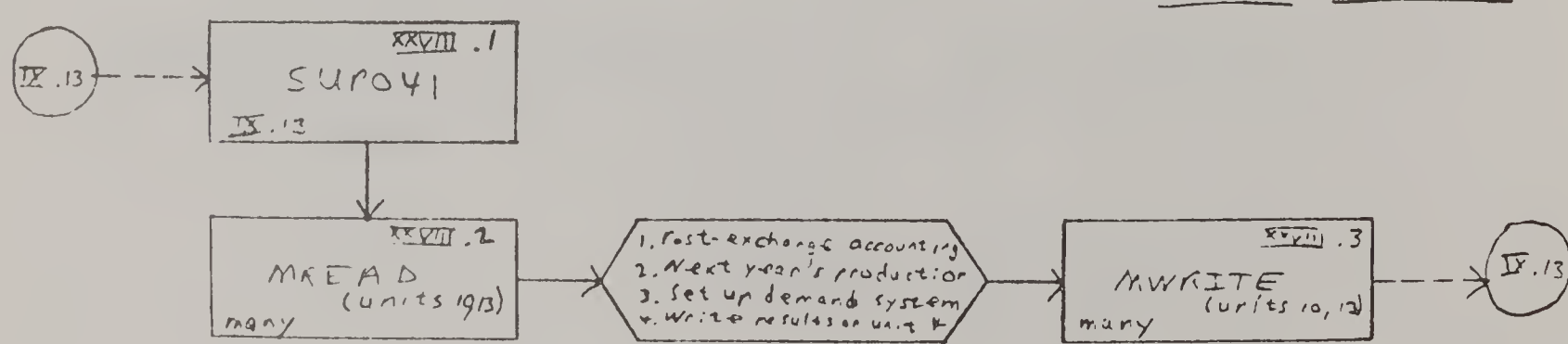


Chart XXIX

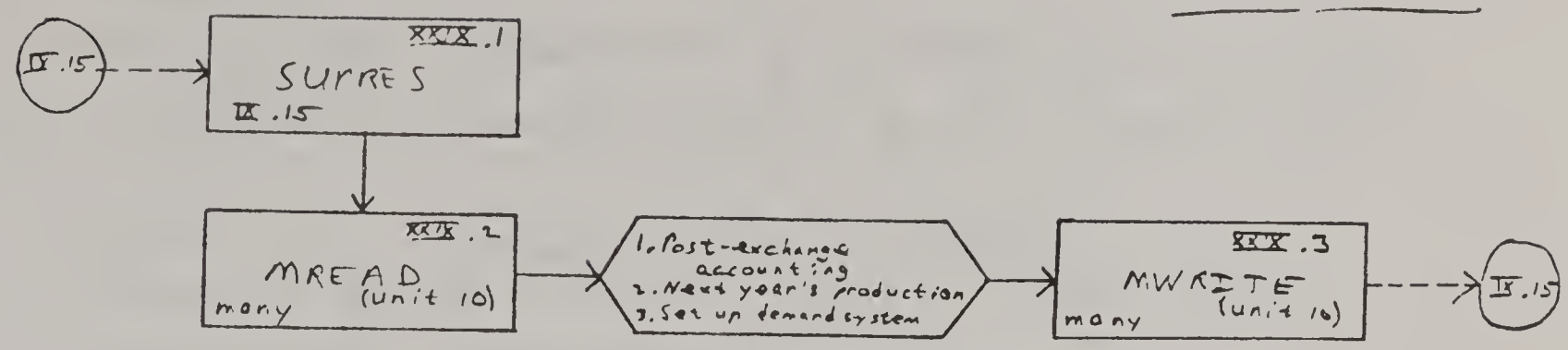


Chart XXX

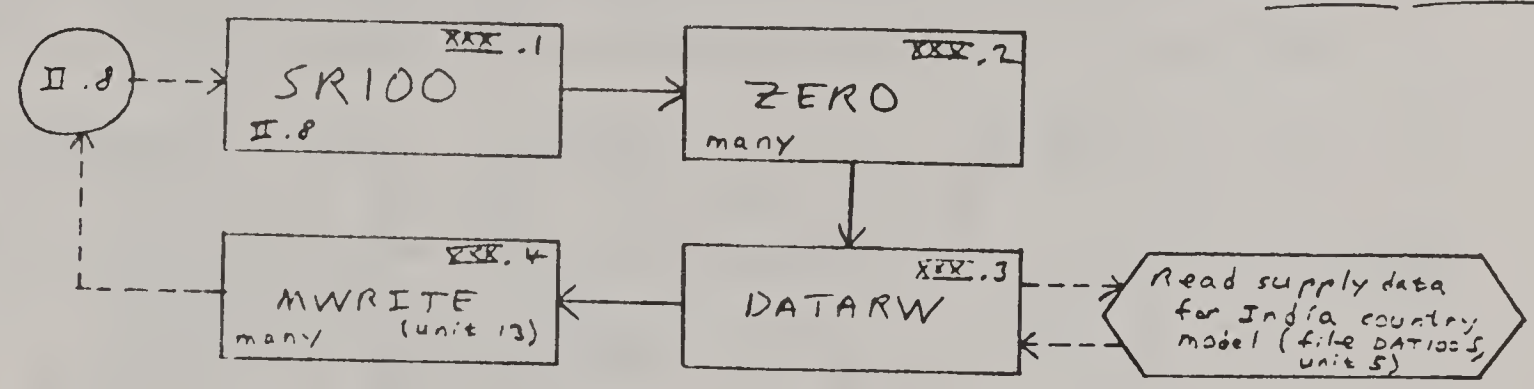


Chart XXXI

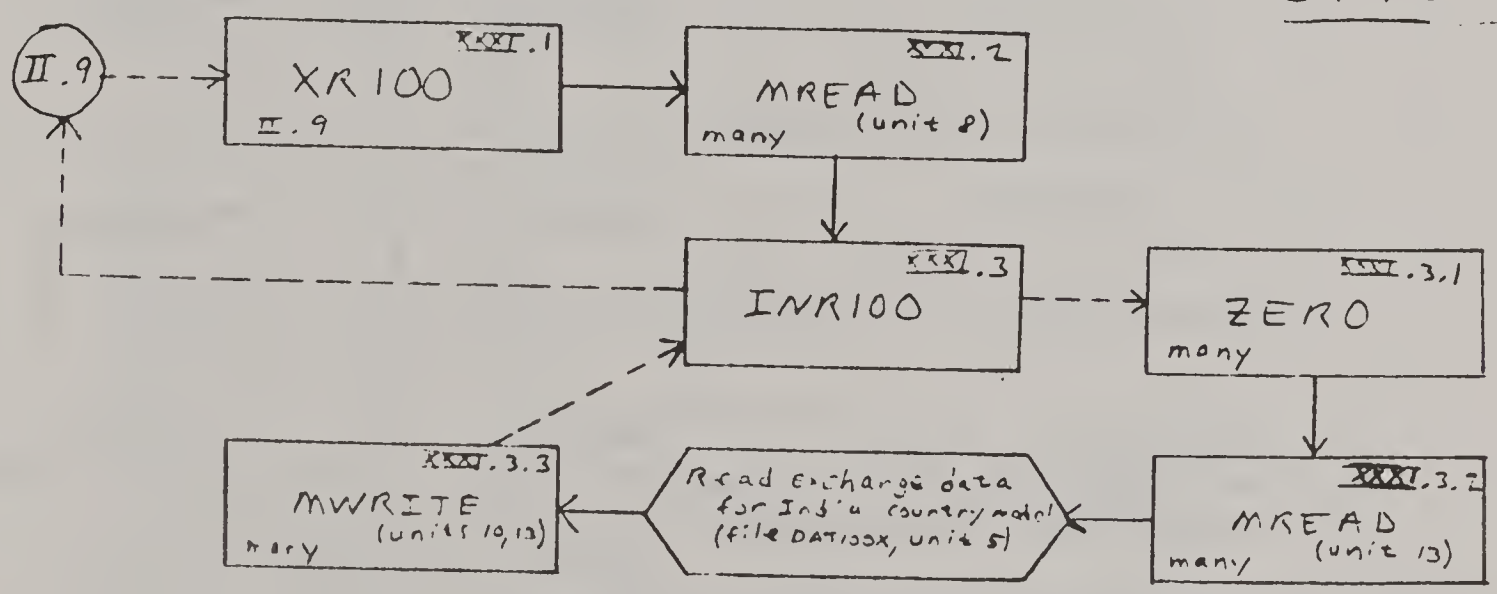
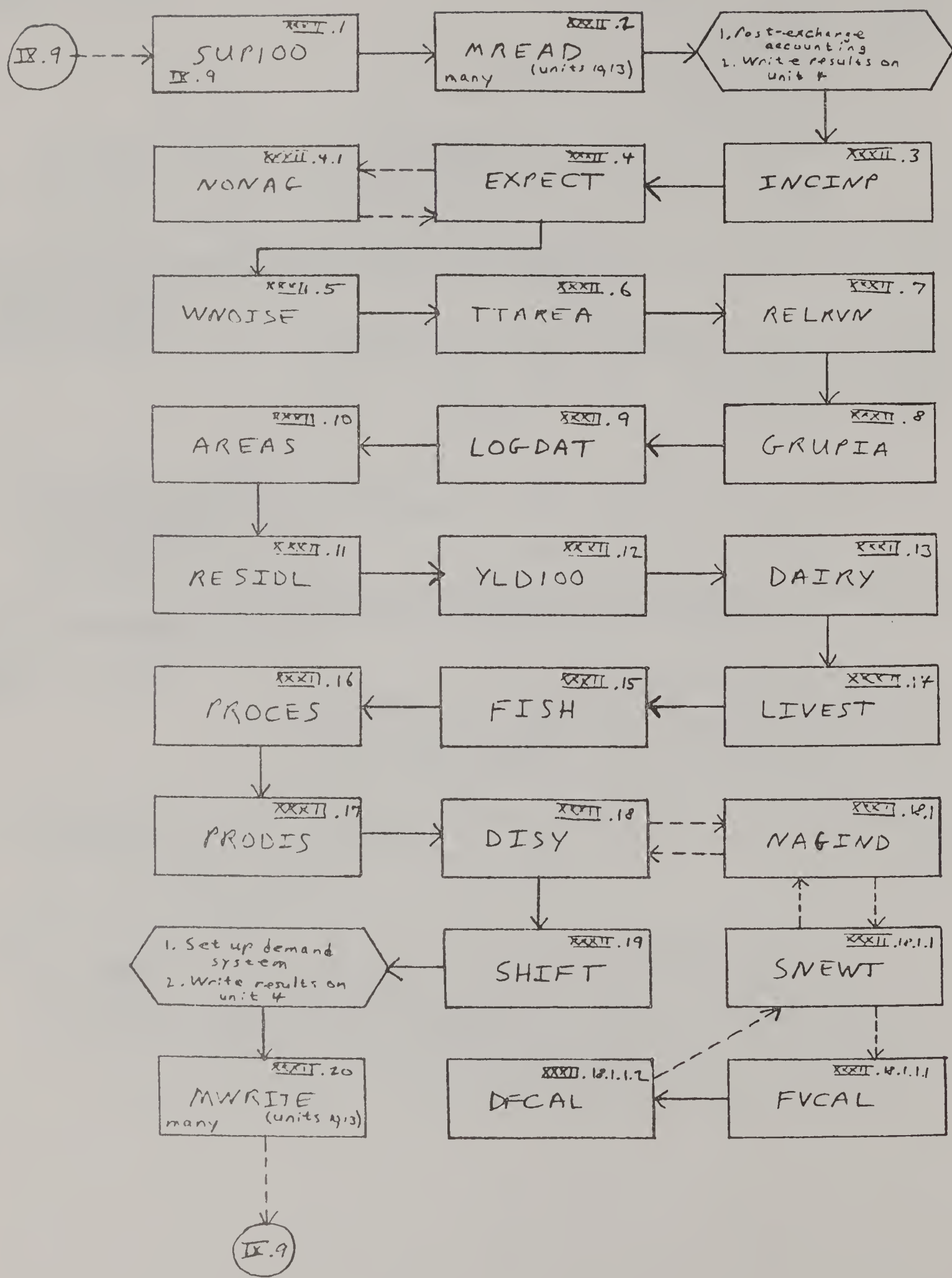


FIG. 5 (cont'd.)
CHART XXXII



Subroutine Definitions

Subroutine and function subprograms are listed here alphabetically by section. The definitions describe, for each subroutine, its principal function and indicate its calling routines and those that it calls. References are also made to the charts in Figure 5. Standard FORTRAN library functions, such as AMAXI, SQRT, EXP, etc., are not included. This section includes the executive superstructure, which links the country models, and the international and domestic equilibrium algorithms.

IIASA Section

BACMOD Back-transformation (double precision) of a country's exchange system to the nonlinear form.
Called by: BALDEF, WRIT3.
Figure 5: Chart VIII.

BALDEF Computes balance of trade deficit.
Called by: STOCK5.
Calls: BACMOD, DBACD.
Figure 5: Chart VIII.

BALS Computes lower bounds on financial policy adjustments.
Called by: NEWTON, STOCK5.
Figure 5: Chart VIII.

BALU Computes upper bounds on financial policy adjustments.
Called by: NEWTON, STOCK5.
Figure 5: Chart VIII.

CALCUL Executive routine for the function evaluation for the international equilibrium nonsmooth optimization algorithm.
Called by: EXCHNG, LIGNE.
Calls: EXCESS, GOAL1, GOAL4, GOAL5, GOAL6, GOAL7, MREAD, MWRITE, TRANSC.
Figure 5: Charts III, IV, V.

CHECK Checks consistency of price, quantity, and financial policy constraints and targets.
Called by: STOCK5.
Figure 5: Chart VIII.

DBACD Calculates the derivative of the back-transformation (double precision) to the nonlinear form of a country's exchange system.
Called by: BALDEF.
Figure 5: Chart VIII.

DBACS Calculates the derivative of the back-transformation (single precision) to the nonlinear form of a country's exchange system.
Called by: JACNEW.
Figure 5: Chart VI.

DINVT Inverts a double precision matrix.
Called by: INVERT, JPRICW, PQEINV.
Figure 5: Chart VIII, XVIII, XIX.

DWDCAL Derivative of dependent variables of exchange with respect to the financial policy adjustment parameter.
Called by: WVAL.
Figure 5: Chart VIII.

DYNEPS Executive routine for the international equilibrium nonsmooth optimization algorithm.
Called by: EXCHNG.
Calls: GAUCHE, LIGNE.
Figure 5: Charts III, IV.

EXCESS Calculates the world excess demand and Jacobian matrix by executing the country exchange modules.
Called by: CALCUL.
Calls: EXIASN, EXUSA1, EXUSA2, EX041, EX100, EX777, REST.
Figure 5: Chart V.

EXCHNG Executive routine of annual exchange equilibrium.
Called by: USWRLD.
Calls: CALCUL, DYNEPS, MREAD, MWRITE, POSTEX.
Figure 5: Charts I, III.

EXCHRD Initializes the exchange module of the standard country models.
Called by: INIT.
Calls: INREAD MREAD.
Figure 5: Charts II, XXIV.

EXIASN Exchange module of the standard country models.
Called by: EXCESS.
Calls: JACNEW, MREAD, MWRITE, STOCK5.
Figure 5: Charts V, VI.

EXREAD Reads the coded file (EXPW on unit 11) of historical world prices and creates the direct access file (unit 12) of exogenous world prices.
Called by: INIT.
Calls: MWRITE.
Figure 5: Chart II.

EXUSA1 Exchange module of the U.S. intermediate country model.
Called by: EXCESS
Calls: JACNEW, MREAD, MWRITE, STOCK5.
Figure 5: Charts V, VI.

EXUSA2 Exchange module of the U.S. detailed country model.
Called by: EXCESS.
Calls: INTBAL, JACUSA, MREAD, MWRITE, POLADJ, PRICIN, STOCK5.
Figure 5: Charts V, XVII.

EX041 Exchange module of the China country model.
Called by: EXCESS.
Calls: MREAD, MWRITE.
Figure 5: Charts V, VII.

EX100 Exchange module of the India country model.
Called by: EXCESS.
Calls: JACNEW, MREAD, MWRITE, STOCK5.
Figure 5: Charts V, VI.

EX777 Exchange module of the CMEA country model.
Called by: EXCESS.
Calls: MREAD, MWRITE.
Figure 5: Charts V, VII.

FAMUSI Initialize the U.S. intermediate country model.
Called by: INIT.
Calls: DATIN, MWRITE, SUPEX.
Figure 5: Charts II, XXI.

GAUCHE Performs a directional search in the nonsmooth optimization algorithm.
Called by: DYNEPS.
Figure 5: Chart IV.

GOAL1 International goal function for competitive equilibrium.
Called by: CALCUL.
Figure 5: Chart V.

GOAL4 International goal function for international buffer stocks policy with target price bands.
Called by: CALCUL.
Calls: MREAD.
Figure 5: Chart V.

GOAL5 International goal function for nonmembers of a price cartel
Called by: CALCUL.
Figure 5: Chart V.

GOAL6 International goal function for members of a price cartel.
Called by: CALCUL.
Calls: GOAL1.
Figure 5: Chart V.

GOAL7 International goal function for competitive equilibrium with endogenous trade balances.
Called by: CALCUL.
Figure 5: Chart V.

INIT Executive routine of model initialization. Reads the coded file (START on unit 2) of run control parameters.
Called by: USWRLD.
Calls: EXCHRD, EXREAD, FAMUSI, INTRD, MOPEN, MWRITE, SR100, SUPRD, SXR041, SXR777, USINIT, XR100.
Figure 5: Charts I, II.

INMAT Initializes the complementarity path algorithm for a country's exchange solution.
Called by: STOCK5.
Calls: PQEQUS, TRAMOS.
Figure 5: Chart VIII.

INTERP Calibrates international policies and "rest of world" each year.
Called by: USWRLD.
Calls: MREAD, MWRITE.
Figure 5: Chart I.

INTRD Reads the coded file (INTDAT on unit 5) of initial world prices and international policies and creates the direct access file (unit 8) of these variables.
Called by: INIT.
Calls: MWRITE.
Figure 5: Chart II.

INVERT Sets up a matrix to be inverted.
Called by: WVAL.
Calls: DINVT.
Figure 5: Chart VIII.

INVT Inverts a single-precision matrix.
Called by: JACNEW.
Figure 5: Chart VI.

JACNEW Calculates the Jacobian matrix of partial derivatives of national excess demand with respect to world prices for country exchange systems in the generalized linear expenditure system form.
Called by: EXIASN, EXUSA1, EX100.
Calls: DBACS, INVT, TRAMOS.
Figure 5: Chart VI.

LIGNE Performs a line search in the nonsmooth optimization algorithm.
Called by: DYNEPS.
Calls: CALCUL.
Figure 5: Chart IV.

MCLOSE Closes direct access files.
Called by: USWRLD.
Figure 5: Chart I.

MOPEN Opens direct access files (replaced by DEFINE FILE in IBM version).
Called by: INIT.
Figure 5: Chart II.

MREAD Reads from direct access files (replaced by DEFINE FILE IN IBM version).
Called by: CALCUL, CRPPOL, CYIELD, DEMOG, EXCHNG, EXCHRD, EXIASN, EXUSA1, EXUSA2, EX041, EX100, EX777, GOAL4, INR100, INTERP, JPOLAD, MACINC, OUTPQE, PQEINV, PRVSTK, PRICIN, RESDEV, REST, SUPFAP, SUPPLY, SUPRES, SUP041, SUP100, SUP231, SUP777, USFISH, USINIT, XR100.
Figure 5: Charts I, III, V, VI, VII, IX, X, XI, XII, XIII, XVI XVII, XIX, XXII, XXIV, XXV, XXVII, XXVIII, XXIX, XXXI, XXXII.

MUADJ Adjusts the financial policy adjustment parameter towards equilibrium.
Called by: STOCK5.
Figure 5: Chart VIII.

MWRITE Writes on direct access files.
Called by: CALCUL, CRPSUI, DEMNDI, EXCHNG, EXIASN, EXREAD, EXUSA1, EXUSA2, EX041, EX100, EX777, FAMUSI, INIT, INPQE, INREAD, INR100, INTERP, INTRD, JEXMOD, LVSUPI, MACROI, PQEINV, PQEQI, RESDVI, REST, SR100, SUPFAP, SUPPLY, SUPRES, SUP041, SUP100, SUP231, SUP777, SXR041, SXR777, TRAFO, USINIT.
Figure 5: Charts I, II, III, V, VI, VII, IX, X, XI, XVII, XXI, XXII, XXIII, XXIV, XXV, XXVI, XXVII, XXVII, XXIX, XXX, XXXI, XXXII.

NEWTON Performs Newton-Raphson iterations on the financial policy adjustment parameters once it has bracketed the equilibrium value.
Called by: STOCK5.
Calls: BALS, BALU.
Figure 5: Chart VIII.

ORDER1 Reorders rows and columns of a matrix.
Called by: REORD.
Figure 5: Chart VIII.

PIVCOM Performs a commodity pivot, for example, when switching a commodity from a price-given/quantity-to-be-determined situation to the reverse, or vice versa.
Called by: STOCK5.
Calls: REORD, TRAMOD, TRAMOS, WPREP.
Figure 5: Chart VIII.

PIVFIN Performs a financial policy pivot, that is, moving up or down the priority ranking of financial policies when a constraint becomes effective.
Called by: STOCK5.
Calls: WPREP.
Figure 5: Chart VIII.

POSTEX Writes results of international policies.
Called by: EXCHNG.
Figure 5: Chart III.

PQEQUS Price-quantity equilibrium function evaluation for the U.S. detailed model during the complementarity path algorithm.
Called by: INMAT, WVAL.
Calls: EXMOD, FINPOL, PQEINV, PQKWN, SOLN.
Figure 5: Charts VIII, XVIII.

REORD Reorders rows and columns of vectors and matrices, placing those corresponding to quantity-fixed commodities first.
Called by: PIVCOM.
Calls: ORDER1.
Figure 5: Chart VIII.

REST Exchange module of the "rest of the world" aggregate model.
Called by: EXCESS.
Calls: MREAD, MWRITE.
Figure 5: Charts V, VI.

RUNDOC Echo prints the START file and increments and prints the run number. Reads and writes the coded file (NUMBER on unit 18) containing the cumulative run number.
Called by: USWRLD.
Figure 5: Not shown.

SELIN Selects initial commodity pivot.
Called by: STOCK5.
Figure 5: Chart VIII.

STOCK5 Executes the complementarity path algorithm for domestic exchange equilibrium, calculating equilibrium net excess demand subject to given world prices, national financial and stock policies, and quota, price and stock constraints.
Called by: EXIASN, EXUSA1, EXUSA2, EX100.
Calls: BALDEF, BALS, BALU, CHECK, INMAT, MUADJ, NEWTON, PIVCOM, PIVFIN, SELIN, WPREP, WRIT3, WVAL.
Figure 5: Charts VI, VIII, XVII.

STEPU Step function of linear segments of unequal length.
Called by: CRPIN, RESDEV, RESDVI, SUPRES.
Figure 5: Not shown.

SUPFAP Supply module of the standard country models.
Called by: SUPPLY.
Calls: CONSC, MAXIM, MREAD, MWRITE, ZERO.
Figure 5: Charts IX, XXV.

SUPPLY Executive routine of annual national supply and policy adjustments.
Called by: USWRLD.
Calls: MREAD, MWRITE, SUPFAP, SUPRES, SUPUSA, SUP041, SUP100 SUP231, SUP777.
Figure 5: Charts I, IX.

SUPRD Initializes the supply module of the standard country models.
Called by: INIT.
Calls: TRAFO.
Figure 5: Charts II, XXIII.

SUPRES Supply module of the "Rest of the World" aggregate model.
Called by: SUPPLY.
Calls: MREAD, MWRITE, STEPU.
Figure 5: Charts IX, XXIX.

SUPUSA Supply module of the U.S. detailed country model.
Called by: SUPPLY, USINIT.
Calls: AGFIN, CNSACC, CRPSUP, DEMOG, EXMOD, INPQE, MACRO, OUTPQE, PRICIN, REGSHR, REPSET, RESDEV, UPLAG, USFISH.
Figure 5: Charts IX, X, XI.

SUP041 Supply module of the China country model.
Called by: SUPPLY.
Calls: MREAD, MWRITE.
Figure 5: Charts IX, XXVIII.

SUP100 Supply module of the India country model.
Called by: SUPPLY.
Calls: AREAS, DAIRY, DISY, EXPECT, FISH, GRUPIA, INCINP, LIVEST, LOGDAT, MREAD, MWRITE, PROCES, PRODIS, RELRVN, RESIDL, SHIFT, TTAREA, WNOISE, YLD100.
Figure 5: Charts IX, XXXII.

SUP231 Supply module of the U.S. intermediate country model.
Called by: SUPPLY.
Calls: EXSUP, FAMUSR, MREAD, MWRITE, SUPEX.
Figure 5: Charts IX, XXII.

SUP777 Supply module of the CMEA country model.
Called by: SUPPLY.
Calls: MAXIM, MREAD, MWRITE.
Figure 5: Charts IX, XXVII.

SXR041 Initializes the China country model.
Called by: INIT.
Calls: MWRITE, ZERO.
Figure 5: Charts II, XXVI.

SXR777 Initializes the CMEA country model.
Called by: INIT.
Calls: MWRITE, ZERO.
Figure 5: Charts II, XXVI.

TABUL Table look-up function which linearly interpolates between constant end-point values outside the given range.
Called by: RESDEV, USFISH, CRPPOL.
Figure 5: Not shown.

TRAMOD Linear transformation (double precision) of a nonlinear exchange system to the generalized linear expenditure system form.
Called by: PIVCOM.
Figure 5: Chart VIII.

TRAMOS Linear transformation (single precision) of a nonlinear exchange system to the generalized linear expenditure system form.
Called by: JACNEW, INMAT, PIVCOM.
Figure 5: Charts VI, VIII.

TRANSC Calculates the transfers needed for an international policy and their derivatives.
Called by: CALCUL.
Figure 5: Chart V.

USINIT Initialize the U.S. detailed country model.
Called by: INIT.
Calls: AGFINI, CONTRI, CRPSUI, DEMNDI, LVSUPI, MACROI, MREAD, MWRITE, PQEQI, RESDVI, SUPUSA.
Figure 5: Charts II, X.

USWRLD Main program of the U.S. world model, the USDA/MSU version of the IIASA world food and agriculture model; called FAPMOD at IIASA; called MAIN on the IBM computer.
Calls: EXCHNG, INIT, INTERP, SUPPLY.
Figure 5: Chart I.

WPREP Prepares for complementarity path function evaluation for generalized linear expenditure exchange system.
Called by: PIVCOM, PIVFIN, STOCK5.
Figure 5: Chart VIII.

WRIT3 Sets up and prints tables of results of national exchange equilibrium.
Called by: STOCK5.
Calls: BACMOD.
Figure 5: Chart VIII.

WVAL Performs the complementarity path function evaluation.
Called by: STOCK5.
Calls: DWDCAL, INVERT, PQEQUS.
Figure 5: Chart VIII.

XR100 Initializes the exchange module of the India country model.
Called by: INIT.
Calls: INR100, MREAD.
Figure 5: Charts II, XXXI.

ZERO Zeroes out initial contents of common blocks.
Called by: INREAD, INR100, SR100, SUPFAP, SXR041, SXR777, TRAFO.
Figure 5: Charts XXIII, XXIV, XXV, XXVI, XXX, XXXI.

U.S. Detailed Model Section

This section includes the executive and components of the U.S. detailed model.

AFDAT BLOCK DATA input for the agricultural finance component.
Figure 5: Chart X.

AFINPT Computation of inputs to the agricultural finance component--value of crop and livestock production and seed and feed demand, and numbers of farms and family workers.
Called by: AGFIN.
Figure 5: Chart XV.

AFOUT Outputs of the agricultural finance component--value of production, value added and agricultural wages and income.
Called by: AGFIN.
Figure 5: Chart XV.

AGFIN Agricultural finance component.
Called by: EXMOD, SUPUSA.
Calls: AFINPT, AFOUT, CURRNT, PRATIO, PRFORM, PRGAIN, PRINTB, PRINTI, PRSAUF.
Figure 5: Charts XI, XIII, XV.

AGFINI Initializes the agricultural finance component.
Called by: USINIT.
Figure 5: Chart X.

ALCBEV Computes the domestic production of wine, beer, and spirits, and the resulting derived demand for grain and fruit inputs.
Called by: DSUP.
Figure 5: Chart XIII.

BUFSTK Demand for policy (price support) stocks, including stocks outstanding under loan, held by CCC, and in farmer-held reserves.
Called by: DEMAND, PRVSTK.
Figure 5: Chart XVI.

CATTLE Cattle sectors--fed and nonfed beef, and dairy--of the livestock supply component.
Called by: LVSUP.
Figure 5: Chart XIV.

CONTRI Defines simulation control parameters, historical time series, and exchange policy parameters.
Called by: USINIT.
Calls: DATIN.
Figure 5: Chart X.

CNSACC Performs post-exchange consumption accounting, computes the consumer price index, and updates current weights for the GNP and consumption deflators; writes results on unit 6.
Called by: SUPUSA.
Figure 5: Chart XI.

CPROD Computes acres harvested, gross crop production, seed use, losses due to waste and spoilage, and net crop production, writes results on unit 6.
Called by: CRPSUP.
Figure 5: Chart XII.

CRPIN Computes exogenous inputs to the crop supply component.
Called by: CRPSUP.
Calls: STEPU.
Figure 5: Chart XII.

CRPPOL Computes commodity program variables set-asides, loan rates, target and support prices, and diversion payments.
Called by: CRPSUP.
Calls: MREAD, TABUL.
Figure 5: Chart XII.

CRPSUI Initializes the crop supply component.
Called by: USINIT.
Calls: MWRITE.
Figure 5: Chart X.

CRPSUP Crop supply component.
Called by: SUPUSA.
Calls: CPROD, CRPIN, CRPPOL, CYIELD, PLANT.
Figure 5: Charts XI, XII.

CSDAT BLOCK DATA input for the crop supply component.
Figure 5: Chart X.

CURRNT Agricultural finance accounting--current flows of receipts and expenditures, balance sheet computation.
Called by: AGFIN.
Calls: DURABL.
Figure 5: Chart XV.

CYIELD Computes crop yields.
Called by: CRPSUP.
Calls: MREAD.
Figure 5: Chart XII.

DAIRYM Computes milk used in manufacturing and the consequent production of cheese, butter and other dairy products.
Called by: DSUP.
Figure 5: Chart XIII.

DATIN Reads the coded data file of historical time series (USDETDAT on unit 17).
Called by: CONTRI, FAMUSI.
Figure 5: Chart X, XXI.

DEMAND Demand component.
Called by: EXMOD.
Calls: BUFSTK, FDSDLS, HUMCNS, INDUS, PRVSTK, TRADE.
Figure 5: Charts XIII, XVI.

DEMNDI Initializes the demand components.
Called by: USINIT
Calls: MWRITE.
Figure 5: Chart X.

DEMOG Demography component.
Called by: SUPUSA.
Calls: MREAD.
Figure 5: Chart XI.

DSUP Computes domestic supply of demand commodities converting from production by supply commodity, determining the production of processed products, and adding carry-in stocks.
Called by: EXMOD.
Calls: ALCBEV, DAIRYM.
Figure 5: Chart XIII.

DURABL Agricultural finance capital accounts--capital stocks, investment, depreciation, capital gains.
Called by: CURRNT.
Figure 5: Chart XV.

EXMOD Exchange module components, that is, those solved simultaneously with prices.
Called by: PQEINV, PQEQUS, SUPUSA.
Calls: AGFIN, DEMAND, DSUP, LVSUP, MACINC, MACMON, MACSUP, NAGSUP PRDPRC, SAGIN.
Figure 5: Charts XI, XIII, XVIII.

EXUSA2 Exchange module of the U.S. detailed country model.
Called by: EXCESS.
Calls: INTBAL, JACUSA, MREAD, MWRITE, POLADJ, PRICIN, STOCK5.
Figure 5: Charts V, XVII.

FDSDLS Utilization for feed, seed, and losses.
Called by: DEMAND.
Figure 5: Chart XVI.

FINPOL U.S. financial adjustments during complementarity path equilibrium algorithm.
Called by: PQEQUS.
Figure 5: Chart XVIII.

GASHOL Production of gasohol and dry distiller's grain by-product.
Called by: INDUS.
Figure 5: Chart XVI.

HOGS Hogs sector of the livestock supply component.
Called by: LVSUP.
Figure 5: Chart XIV.

HUMCONS Human consumption demand (reads HUMCONS data file on unit 16).
Called by: DEMAND.
Calls: SHARE.
Figure 5: Chart XVI.

INDUS Demand for industrial, nonfood uses.
Called by: DEMAND.
Calls: GASHOL.
Figure 5: Chart XVI.

INPQE Sets up inputs to the price-quantity exchange equilibrium and writes them on direct access file 10.
Called by: SUPUSA.
Calls: MWRITE.
Figure 5: Chart XI.

INTBAL International transfers and trades balance for the U.S. exchange.
Called by: EXUSA2.
Figure 5: Chart XVII.

JACUSA Executive routine for the Jacobian calculation for the U.S. exchange.
Called by: EXUSA2.
Calls: JEXDMW, JEXMOD, JPOLAD, JPRICI, JPRICW.
Figure 5: Charts XVII, XIX.

JAGFIN For the U.S. Jacobian, computes the partial derivative of agricultural finance outputs with respect to retail prices--corresponds to AGFIN.
Called by: JEXMOD.
Calls: JDUMCP.
Figure 5: Chart XX.

JDEMND For the U.S. Jacobian, computes the partial derivative of demand with respect to retail prices--corresponds to DEMAND.
Called by: JEXMOD.
Calls: JDUMCP, JHUMCN.
Figure 5: Chart XX.

JDSUP For the U.S. Jacobian, computes the partial derivative of domestic supply with respect to retail prices--corresponds to DSUP.
Called by: JEXMOD.
Figure 5: Chart XX.

JDUMCP For the U.S. Jacobian, uses the chain rule to convert from partial derivatives with respect to producer prices to those with respect to retail prices.
Called by: JAGFIN, JDEMND, JLVSUP, JMACIN, JMACSU, JNAGSU, JPRICI
Figure 5: Charts XIX, XX

JEXDMW For the U.S. Jacobian, computes the partial derivative of net excess demand with respect to world prices.
Called by: JACUSA.
Figure 5: Chart XIX.

JEXMOD For the U.S. Jacobian, computes the partial derivative of net excess demand with respect to domestic retail prices--corresponds to EXMOD.
Called by: JACUSA.
Calls: JAGFIN, JDEMND, JDSUP, JLVSUP, JMACIN, JMACMO, JMACSU, JNAGSU, JSAGIN, MWRITE.
Figure 5: Charts XIX, XX.

JHUMCN For the U.S. Jacobian, computes the partial derivative of human consumption with respect to retail prices--corresponds to HUMCONS (reads HUMCONS data file on unit 16).
Called by: JDEMND.
Calls: JSHARE.
Figure 5: Chart XX.

JLVSUP For the U.S. Jacobian, computes the partial derivative of livestock supply with respect to retail prices--corresponds to LVSUP.
Called by: JEXMOD.
Calls: JDUMCP.
Figure 5: Chart XX.

JMACIN For the U.S. Jacobian, computes the partial derivative of macroeconomy income accounting and consumption expenditures with respect to retail prices--corresponds to MACINC.
Called by: JEXMOD.
Calls: JDUMCP.
Figure 5: Chart XX.

JMACMO For the U.S. Jacobian, computes the partial derivative of real GNP, money supply, and interest rates with respect to retail prices--corresponds to MACMON.
Called by: JEXMOD.
Figure 5: Chart XX.

JMACSU For the U.S. Jacobian, computes the partial derivative of the wage rate and real nonagricultural GNP with respect to producer and retail prices--corresponds to MACSUP.
Called by: JEXMOD.
Calls: JDUMCP.
Figure 5: Chart XX.

JNAGSU For the U.S. Jacobian, computes the partial derivative of nonagricultural supply with respect to retail prices--corresponds to NAGSUP.
Called by: JEXMOD.
Calls: JDUMCP.
Figure 5: Chart XX.

JPOLAD For the U.S. Jacobian, computes the partial derivative of policy stocks and quantity constraints with respect to domestic retail prices--corresponds to POLADJ.
Called by: JACUSA.
Calls: MREAD.
Figure 5: Chart XIX.

JPRICI For the U.S. Jacobian, computes the partial derivative of price relationships--corresponds to PRICIN.
Called by: JACUSA.
Calls: JDUMCP.
Figure 5: Chart XIX.

JPRICW For the U.S. Jacobian, computes the partial derivative of domestic equilibrium prices with respect to world prices.
Called by: JACUSA.
Calls: DINVT.
Figure 5: Chart XIX.

JSAGIN For the U.S. Jacobian, computes the partial derivative of simultaneous agricultural product and input prices with respect to producer prices--corresponds to SAGIN.

JSHARE For the U.S. Jacobian, computes the partial derivative of consumption expenditure shares with respect to retail prices--corresponds to SHARE (reads HUMCONS data file on unit 16).
Called by: JHUMCN.
Figure 5: Chart XX.

LVDAT BLOCK DATA input for the livestock supply component.
Figure 5: Chart X.

LVFEED Livestock feed demand.
Called by: LVSUP.
Figure 5: Chart XIV.

LVIN Dummy variables and price inputs for the livestock supply component.
Called by: LVSUP.
Figure 5: Chart XIV.

LVOUT Outputs of the livestock supply component--gross and net production, demand for feed commodities--in metric units.
Called by: LVSUP.
Figure 5: Chart XIV.

LVSUP Livestock supply component.
Called by: EXMOD.
Calls: CATTLE, HOGS, LVFEED, LVIN, LVOUT, PLTRY, SHEEP.
Figure 5: Charts XIII, XIV.

LVSUPI Initialize the livestock supply component.
Called by: USINIT.
Calls: MWRITE.
Figure 5: Chart X.

MACINC Macroeconomy income accounting.
Called by: EXMOD.
Calls: MREAD.
Figure 5: Chart XIII.

MACINV Computes nonagricultural fixed, residential and inventory investment, and updates capital stocks.
Called by: MACRO.
Figure 5: Chart XI.

MACLAG Updates lagged variables in the macroeconomy component.
Called by: MACRO.
Figure 5: Chart XI.

MACMON Macroeconomy money supply and interest rate.
Called by: EXMOD.
Figure 5: Chart XIII.

MACRO Macroeconomy component (post-exchange part).
Called by: SUPUSA.
Calls: MACINV, MACLAG.
Figure 5: Chart XI.

MACROI Initialize the macroeconomy component.
Called by: USINIT.
Calls: MWRITE.
Figure 5: Chart X.

MACSUP Macroeconomy supply--national wage rate, unemployment rate, and nonagricultural GNP.
Called by: EXMOD.
Figure 5: Chart XIII.

MEDATA BLOCK DATA input for the macroeconomy component.
Figure 5: Chart X.

NAGSUP Nonagricultural production.
Called by: EXMOD.
Figure 5: Chart XIII.

OUTPQE Reads outputs of price-quantity exchange equilibrium from direct acces file 10.
Called by: SUPUSA.
Calls: MREAD.
Figure 5: Chart XI.

PLANT Computes acres planted, constrained by available extensive and intensive land resources.
Called by: CRPSUP.
Figure 5: Chart XII.

PLTRY Poultry sector--broilers and nonbroilers, layers and eggs, and turkeys--of the livestock supply component.
Called by: LVSUP.
Figure 5: Chart XIV.

POLADJ Adjustments of U.S. trade, stock, and financial policies to world prices.
Called by: EXUSA2.
Figure 5: Chart XVII.

PQEDER Computes gradient for U.S. demand-price equilibrium search algorithm.
Called by: PQEINV.
Calls: JPRICI, JEXMOD.
Figure 5: Chart XVIII.

PQEINV Gradient search algorithm to solve for U.S. equilibrium prices when quota constraints are effective.
Called by: PQEQUS.
Calls: DINVT, EXMOD, MREAD, MWRITE, PQEDER.
Figure 5: Chart XVIII.

PQEQI Initializes prices for the price-quantity equilibrium component.
Called by: USINIT.
Calls: MWRITE.
Figure 5: Chart X.

PQEQUS Price-quantity equilibrium function evaluation for the U.S. detailed model during the complementarity path algorithm.
Called by: INMAT, WVAL.
Calls: EXMOD, FINPOL, PQEINV, PQKWN, SOLN.
Figure 5: Charts VIII, XVIII.

PQKWN Sets known (target) prices and quantities for the gradient search algorithm to solve for the corresponding quantities and prices.
Called by: PQEQUS.
Figure 5: Chart XVIII.

PRATIO Prints agricultural finance accounting ratios.
Called by: AGFIN.
Figure 5: Chart XV.

PRDPRC Computes producer prices by demand commodity, supply prices by supply commodity, and consumption and GNP deflators as functions of retail prices and processing and marketing margins.
Called by: EXMOD, PRICIN.
Figure 5: Charts XIII, XVII.

PRFORM Prints agricultural finance capital formation accounts.
Called by: AGFIN.
Figure 5: Chart XV.

PRGAIN Prints agricultural finance capital gains statement.
Called by: AGFIN.
Figure 5: Chart XV.

PRICIN Determines domestic retail and producer prices and price indices as functions of world prices and tariff policies, and makes conversions from the international commodity definitions and units to the domestic U.S. commodities and units.
Called by: EXUSA2, SUPUSA.
Calls: MREAD, PRDPRC.
Figure 5: Charts XI, XVII.

PRINTB Prints agricultural finance balance sheet.
Called by: AGFIN.
Figure 5: Chart XV.

PRINTI Prints agricultural finance income statement.
Called by: AGFIN.
Figure 5: Chart XV.

PRSAUF Prints agricultural finance cash sources and use of funds statement.
Called by: AGFIN.
Figure 5: Chart XV.

PRVSTK Demand for private free stocks.
Called by: DEMAND.
Calls: BUFSTK, MREAD.

REGSHR Allocates national results to regional and state shares (not currently operational).
Called by: SUPUSA.
Figure 5: Chart XI.

REPSET Sets up and stores observations for the U.S. detailed model report writer (not currently operational).
Called by: SUPUSA.
Figure 5: Chart XI.

RESDAT BLOCK DATA input for the resource development component.
Figure 5: Chart X.

RESDEV Resource development component, computing available land resources (extensive and intensive), by region and national; writes results on unit 6.
Called by: SUPUSA.
Calls: MREAD, STEPU, TABUL.
Figure 5: Chart XI.

RESDVI Initializes the resource development component.
Called by: USINIT.
Calls: MWRITE, STEPU.
Figure 5: Chart X.

SAGIN Computes product and input prices for simultaneous agricultural components (AGFIN and LVSUP).
Called by: EXMOD.
Figure 5: Chart XIII.

SHARE Demand for private free stocks (reads HUMCONS data file on unit 16).
Called by: DEMAND.
Calls: BUFSTK, MREAD.

SHEEP Sheep sector of the livestock supply component.
Called by: LVSUP.
Figure 5: Chart XIV.

SOLN Returns the function evaluation solution for the U.S. complementarity path equilibrium.
Called by: PQEQUS.
Figure 5: Chart XVIII.

SUPUSA Supply module of the U.S. detailed country model.
Called by: SUPPLY, USINIT.
Calls: AGFIN, CNSACC, CRPSUP, DEMOG, EXMOD, INPQE, MACRO, OUTPQE, PRICIN, REGSHR, REPSET, RESDEV, UPLAG, USFISH.
Figure 5: Charts IX, X, XI.

TRADE Computes total domestic demand and carry-out stocks, and net excess demand.
Called by: DEMAND.
Figure 5: Chart XVI.

USDATA BLOCK DATA input for the U.S. detailed country model in general.
Figure 5: Chart X.

USFISH Projects U.S. fish production and losses due to spoilage and waste.
Called by: SUPUSA.
Calls: MREAD, TABUL.
Figure 5: Chart XI.

UPLAG Updates lagged variables for the U.S. detailed country model in general.
Called by: SUPUSA.
Figure 5: Chart XI.

USINIT Initializes the U.S. detailed country model.
Called by; INIT.
Calls: AGFINI, CONTRI, CRPSUI, DEMNDI, LVSUPI, MACROI, MREAD, MWRITE, PQEQI, RESDVI, SUPUSA.
Figure 5: Charts II, X.

U.S. Basic (Intermediate) Model Section

This section includes the executive and components of the U.S. intermediate model.

BKDATA BLOCK DATA input for the U.S. intermediate country model.
Figure 5: Chart XXI.

DATIN Reads the coded data file of historical time series (USINTDAT on unit 17).
Called by: CONTRI, FAMUSI.
Figure 5: Charts X, XXI.

EXSUP Interface from the exchange to supply modules--equilibrium prices and demand by the domestic commodity list.
Called by: SUP231.
Calls: FEED.
Figure 5: Chart XXII.

EXUSA1 Exchange module of the U.S. intermediate country model.
Called by: EXCESS.
Calls: JACNEW, MREAD, MWRITE, STOCK5.
Figure 5: Charts V, VI.

FAMUSI Initializes the U.S. intermediate country model.
Called by: INIT.
Calls: DATIN, MWRITE, SUPEX.
Figure 5: Charts II, XXI.

FAMUSR Simulates the general economy, commodity program adjustments, and crops and livestock production.
Called by: SUP231.
Figure 5: Chart XXII.

FEED Gasohol production and the demand for feeds, accounting for the dry distiller's grain by-product as a feed.
Called by: EXSUP, SUPEX.
Figure 5: Chart XXII.

SUPEX Interface from the supply to the exchange modules--domestic supply; trade, stock, and price policies; and linearization of demand.
Called by: FAMUSI, SUP231.
Calls: FEED.
Figure 5: Charts XXI, XXII.

SUP231 Supply module for the U.S. intermediate country model.
Called by: SUPPLY.
Calls: EXSUP, FAMUSR, MREAD, MWRITE, SUPEX.
Figure 5: Charts IX, XXII.

Other Basic Country Models Section

This section includes the programs of the non-U.S. basic country models in IIASA's basic linked system.

AREAS India supply module acreage projections.
Called by: SUP100.
Figure 5: Chart XXXII.

CONSC Contains alternative per capita consumption function options for standard country models.
Called by: SUPFAP.
Figure 5: Chart XXV.

DAIRY India supply module dairy production.
Called by: SUP100.
Figure 5: Chart XXXII.

DATARW Reads and transforms India supply data from the coded file DATS100 on unit 5 to the direct access file on unit 13.
Called by: SR100.
Figure 5: Chart XXX.

DFCAL Calculates the analytical derivative of a given function for Newton's method in the India supply module.
Called by: SNEWT.
Figure 5: Chart XXXII.

DISY India supply module distribution of endowments among income classes.
Called by: SUP100.
Calls: NAGIND.
Figure 5: Chart XXXII.

EXCHRD Initializes the exchange module of the standard country models.
Called by: INIT.
Calls: INREAD, MREAD.
Figure 5: Charts II, XXIV.

EXIASN Exchange module of the standard country models.
Called by: EXCESS.
Calls: JACNEW, MREAD, MWRITE, STOCK5.
Figure 5: Charts V, VI.

EXPECT India supply module expected population, rainfall, prices and nonagricultural production.
Called by: SUP100.
Calls: NONAG.
Figure 5: Chart XXXII.

EX041 Exchange module of the China country model.
Called by: EXCESS.
Calls: MREAD, MWRITE.
Figure 5: Charts V, VII.

EX100 Exchange module of the India country model.
Called by: EXCESS.
Calls: JACNEW, MREAD, MWRITE, STOCK5.
Figure 5: Charts V, VI.

EX777 Exchange module of the CMEA country model.
Called by: EXCESS.
Calls: MREAD, MWRITE.
Figure 5: Charts V, VII.

FISH India supply module fish production.
Called by: SUP100.
Figure 5: Chart XXXII.

FVCAL Calculates the value of a given function for Newton's method in the India supply module.
Called by: SNEWT.
Figure 5: Chart XXXII.

GRUPIA India supply module group irrigated areas.
Called by: SUP100.
Figure 5: Chart XXXII.

INCINP India supply module price increase rate.
Called by: SUP100.
Figure 5: Chart XXXII.

INREAD Reads and transforms standard country exchange data from the coded file DATN on unit 5 to the direct access file on unit 10.
Called by: EXCHRD.
Calls: MWRITE, ZERO.
Figure 5: Chart XXIV.

INR100 Reads and transforms India exchange data from the coded file DATS100 on unit 5 to the direct access file on unit 10.
Called by: XR100.
Calls: MREAD, MWRITE, ZERO.
Figure 5: Chart XXXI.

LIVEST India supply module livestock production.
Called by: SUP100.
Figure 5: Chart XXXII.

LOGDAT India supply module logarithmic transformations.
Called by: SUP100.
Figure 5: Chart XXXII.

MAXIM Agricultural production input allocation algorithm.
Called by: SUPFAP, SUP777.
Figure 5: Charts XXV, XXVII.

NAGIND India supply module nonagricultural income distribution.
Called by: DISY.
Calls: SNEWT.
Figure 5: Chart XXXII.

NONAG India supply module nonagricultural production.
Called by: EXPECT.
Figure 5: Chart XXXII.

PROCES India supply module processing margins.
Called by: SUP100.
Figure 5: Chart XXXII.

PRODIS India supply module food procurement and distribution.
Called by: SUP100.
Figure 5: Chart XXXII.

RELRVN India supply module expected relative crop revenues.
Called by: SUP100.
Figure 5: Chart XXXII.

RESIDL India supply module residual area allocation.
Called by: SUP100.
Figure 5: Chart XXXII.

SHIFT India supply module updating of lags.
Called by: SUP100.
Figure 5: Chart XXXII.

SNEWT Newton's solution method in the India supply module.
Called by: NAGIND.
Calls: DFCAL, FVCAL.
Figure 5: Chart XXXII.

SR100 Initializes the supply module of the India country model.
Called by: INIT.
Calls: DATARW, MWRITE, ZERO.
Figure 5: Charts II, XXX.

SUPFAP Supply module of the standard country models.
Called by: SUPPLY.
Calls: CONSC, MAXIM, MREAD, MWRITE, ZERO.
Figure 5: Charts IX, XXV.

SUPRD Initializes the supply module of the standard country models.
Called by: INIT.
Calls: TRAFO.
Figure 5: Charts II, XXIII.

SUPRES Supply module of the "rest of the world" aggregate model.
Called by: SUPPLY.
Calls: MREAD, MWRITE, STEPU.
Figure 5: Charts IX, XXIX.

SUP041 Supply module for the China country model.
Called by: SUPPLY.
Calls: MREAD, MWRITE.
Figure 5: Charts IX, XXVIII.

SUP100 Supply module of the India country model.
Called by: SUPPLY.
Calls: AREAS, DAIRY, DISY, EXPECT, FISH, GRUPIA, INCINP, LIVEST, LOGDAT, MREAD, MWRITE, PROCES, PRODIS, RELRVN, RESIDL, SHIFT, TTAREA, WNOISE, YLD100.
Figure 5: Charts IX, XXXII.

SUP777 Supply module for the CMEA country model.
Called by: SUPPLY.
Calls: MAXIM, MREAD, MWRITE.
Figure 5: Charts IX, XXVII.

SXR041 Initializes the China country model; reads the coded file DAT041 on unit 5 and writes to the direct access files 10 and 13.
Called by: INIT.
Calls: MWRITE, ZERO.
Figure 5: Charts II, XXVI.

SXR777 Initializes the CMEA country model; reads the coded file DAT777 on unit 5 and writes to the direct access file 10.
Called by: INIT.
Calls: MWRITE, ZERO.
Figure 5: Charts II, XXVI.

TRAFO Reads and transforms standard country supply data from the coded file DATS on unit 5 to the direct access file on unit 13.
Called by: SUPRD.
Calls: MWRITE, ZERO.
Figure 5: Chart XXIII.

TTAREA India supply module available land resources.
Called by: SUP100.
Figure 5: Chart XXXII.

WNOISE India supply module white noise for yield and price expectations.
Called by: SUP100.
Figure 5: Chart XXXII.

XR100 Initializes the exchange module of the India country model.
Called by: INIT.
Calls: INR100, MREAD.
Figure 5: Charts II, XXXI.

YLD100 India supply module crop yield projections.
Called by: SUP100.
Figure 5: Chart XXXII.

Chapter 4

INTERNAL AND EXTERNAL COMMUNICATION

Internal communication among the components of the USWRLD system's computer program is via COMMON blocks parameter lists, and direct access disk files. Information is passed to the model through FORTRAN BLOCK DATA routines and through coded sequential disk files. Model outputs are stored on coded sequential disk files for later printing and/or disk cataloging. In addition, the internal direct access files may be saved at various points during simulation in order to later restart or reinitialize the model at those points. This chapter documents the model's use of each of these means of communication.

Subroutine Parameter Lists

The following list shows, for each general section of the program, those subroutines and functions which have information passed to or from them via parameter lists. For each such subprogram, the number of parameters in the list (some of which may be arrays) is enclosed in parentheses, and its calling routines are listed in the previous chapter. Many of these also communicate via COMMON blocks and direct access files, as the later sections of this chapter indicate.

The IIASA Section

BACMOD (2)	BALS (7)	BALU (7)	CALCUL (3)
DBACD (2)	DBACS (2)	DYNEPS (11)	GAUCHE (13)
GOAL1 (2)	GOAL4 (2)	GOAL5 (2)	GOAL6 (2)
GOAL7 (2)	INIT (1)	DINVT (5)	INVT (5)
LIGNE (18)	MREAD (5)	MWRITE (5)	NEWTON (13)
ORDER1 (2)	PIVFIN (2)	STEPU (4)	STOCK5 (3)
SUPRES (4)	TABUL (4)	TRAMOD (2)	TRAMOS (2)
WRIT3 (1)	ZERO (2)		

The Detailed U.S. Model Section

AFINPT (3)	AGFIN (1)	CATTLE (1)	CURRNT (3)
DURABL (4)	FINPOL (15)	INPQE (1)	JDUMCP (4)
JPRICI (1)	JSHARE (12)	LVFEED (1)	LVSUP (1)
PQEDER (3)	PQEINV (2)	PQEQUS (15)	PWKWN (6)
PRATIO (1)	PRDPRC (1)	PRFORM (1)	PRGAIN (1)
PRICIN (1)	PRINTB (1)	PRINTI (1)	PRSAUF (1)
SAGIN (1)	SHARE (8)	SOLN (11)	SUPUSA (3)

The Intermediate U.S. Model Section

DATIN (18)	EXUSA1 (1)	SUP231 (3)

The India Model Section

AREAS (1)	DAIRY (5)	DISY (2)	EXPECT (1)
FISH (5)	DFCAL (2)	GRUPIA (5)	INCINP (5)
INR100 (6)	FVCAL (3)	NAGIND (5)	NONAG (1)
PROCES (7)	LIVEST (1)	SNEWT (3)	SUP100 (6)
TTAREA (4)	PRODIS (1)	YLD100 (7)	WNOISE (4)

The Other Country Models Section

CONSC (7)	EXIASN (1)	INREAD (7)	MAXIM (5)
SUPFAP (7)	SUP041 (6)	SUP777 (6)	TRAFO (6)

The Other Country Report Writer

BILD (11)	CFORM (1)	PFORM (3)	PLOT (3)
SCALE (1)	TABLE (2)		

COMMON Blocks

The major means of communication among subroutines and model components is labeled COMMON blocks. The descriptions below show, for each one:

(1) the section of the model it is primarily associated with (although it may be used for communication among sections);
(2) the general nature of its contents and purpose;
(3) size (number of single-precision, or four-byte, words); and
(4) the subroutines it appears in.

COMMON WORK is used in a number of places in several forms for various purposes; therefore, its contents are not described. The model sections referred to in the descriptions are:

IIASA -- the superstructure linking the national models, and the domestic and international equilibrium algorithms;
DETAIL -- the detailed U.S. model;
INTERM -- the intermediate U.S. model;
INDIA -- the India model;
OTHER -- other country models.

ACT Section: IIASA.
Contents: National results of exchange equilibrium passed to country supply modules.
Size: 707 words.
Subroutines: BALDEF, BUFSTK, CHECK, DISY, DWDCAL, EXIASN, EXUSA1, EXUSA2, EX100, INMAT, INPQE, INREAD, INR100, INTBAL, INVERT, JACNEW, JDEMND, JLVSUP, JPOLAD, JPRICI, JSAGIN, MUADJ, OUTPQE, PIVCOM, PIVFIN, POLADJ, PQEQI, PRDPRC, PRICIN, PRODIS, REORD, SELIN, STOCK5, SUPFAP, SUP100, WPREP, WRIT3, WVAL.

AGINCO Section: DETAIL.
Contents: Coefficients of equations for agricultural input prices.
Size: 65 words.
Subroutines: AFDAT, AGFINI, CURRNT, JAGFIN, JSAGIN, PQEQI, SAGIN.

AMOI Section: IIASA.
Contents: Number of international commodities, iteration limit, and mode.
Size: 42 words.
Subroutines: BUFSTK, CALCUL, DYNEPS, EXCESS, EXCHNG, EXCHRD, EXREAD, EXUSA2, EX041, EX100, EX777, FAMUSI, GOAL1, GOAL4, GOAL5, GOAL6, GOAL7, INIT, INPQE, INTBAL, INTERP, INTRD, JPRICI, MACINC, POSTEX, PRICIN, REST, SR100, SUPPLY, SUPRD, SXR041, SXR777, TRANSC, USINIT, USWRLD, XR100.

BALNCE Section: DETAIL.
Contents: Depreciation, debts, capital assets, and balance sheet variables for the Agricultural Finance component.
Size: 54 words.
Subroutines: AFDAT, AGFINI, CURRNT, DURABL, JAGFIN, MACINC, MACROI, PRATIO, PRINTB.

CATCO Section: DETAIL.
Contents: Coefficients for the cattle subcomponent equations.
Size: 101 words.
Subroutines: CATTLE, JLVSUP, LVDAT, LVIN, PQEQI.

CATLAG Section: DETAIL.
Contents: Lagged variables of the cattle subcomponent.
Size: 58 words.
Subroutines: CATTLE, JLVSUP, LVIN LVSUPI, PLANT, PQEQI, UPLAG.

CATNV Section: DETAIL.
Contents: Internal variables of the cattle subcomponent.
Size: 23 words.
Subroutines: CATTLE, CURRNT, JLVSUP, LVFEED, LVOUT, LVSUPI, UPLAG.

CBAFXS Section: DETAIL.
Contents: Outputs of Agricultural Finance to supply components, currently only farm capital resources.
Size: 13 words.
Subroutines: CURRNT.

CBAFXX Section: DETAIL.
Contents: Outputs of Agricultural Finance to exchange components.
Size: 41 words.
Subroutines: AFOUT, BUFSTK, CNSACC, CPROD, CURRNT, DSUP, EXMOD, INDUS, JDEMND, JMACMO, LVOUT, MACINC, MACMON, MACROI, NAGSUP, USFISH.

CBAGIN Section: DETAIL.
Contents: Prices of agricultural inputs and certain products.
Size: 26 words.
Subroutines: AFINPT, AGFINI, CATTLE, CURRNT, CYIELD, DURABL, GASHOL, HOGS, JAGFIN, JDEMND, JLVSUP, JSAGIN, LVFEED, LVIN, PLTRY, PQEQI, PRVSTK, SAGIN, SHEEP, UPLAG.

CBCPLX Section: DETAIL.
Contents: Policy variables of the Crop Supply component.
Size: 22 words.
Subroutines: CRPPOL, PLANT.

CBCPOL Section: DETAIL.
Contents: Internal variables of the Crop Policy subcomponent.
Size: 42 words.
Subroutines: BUFSTK, CRPPOL, CRPSUI, CURRNT, PLANT, UPLAG.

CBCSX Section: DETAIL.
Contents: Output variables of the Crop Supply component--crop production, land planted and harvested, yields, acres, seed requirements.
Size: 1,158 words.
Subroutines: AFINPT, CPROD, CRPSUI, CYIELD, JAGFIN, LVOUT, PLANT, PRICIN, RESDEV, UPLAG.

CBDATA Section: DETAIL.
Contents: General coefficients and parameters of the detailed U.S. model.
Size: 190 words.
Subroutines: AFINPT, ALCBEV, BUFSTK, CRPSUI, CURRNT, DAIRYM, DEMNDI, DSUP, DURABL, FDSDLS, INDUS, JAGFIN, JDEMND, JDSUP, DEXDMW, JLVSUP, JNAGSU, JPRICI, JSAGIN, LVIN, LVOUT, LVSUPI, NAGSUP, PLANT, PQEQI, PRICIN, PRVSTK, SAGIN, UPLAG, USDATA.

CBDEXS Section: DETAIL.
Contents: Outputs of Demand to supply components--carry-out stocks and domestic supply and demand.
Size: 105 words.
Subroutines: ALCBEV, BUFSTK, DAIRYM, DSUP, INDUS, INPQE, PRVSTK, TRADE, UPLAG.

CBDEXX Section: DETAIL.
Contents: Outputs of Demand to exchange components--demand by categories of disappearance.
Size: 455 words.
Subroutines: BUFSTK, CNSACC, DURABL, FDSDLS, HUMCNS, INDUS, INPQE, JDEMND, JEXDMW, JHUMCN, JLVSUP, LVOUT, MACINC, PQEINV, PQEQUS, PRVSTK, TRADE, UPLAG.

CBDGX Section: DETAIL.
Contents: Outputs of the demography component--population and labor force.
Size: 3 words.
Subroutines: CNSACC, DEMOG, HUMCNS, JHUMCN, JMACIN, JMACSU, MACINC, MACINV, MACLAG, MACROI, MACSUP, RESDEV.

CBFIN Section: DETAIL.
Contents: Financial policy variables--tax rate.
Size: 2 words.
Subroutines: INPQE, JMACIN, MACINC, PQEQUS.

CBFISH Section: DETAIL.
Contents: Parameters and variables of the U.S. fish production component.
Size: 24 words.
Subroutines: LVSUPI, USDATA, USFISH.

CBGHOL Section: DETAIL.
Contents: Gasohol subcomponent variables.
Size: 11 words.
Subroutines: DEMNDI, GASHOL, INDUS, JDEMND, UPLAG.

CBLAG Section: DETAIL.
Contents: General lagged variables of the detailed U.S. model.
Size: 156 words.
Subroutines: AFINPT, AGFINI, BUFSTK, CATTLE, CRPPOL, CRPSUI, CURRNT, CYIELD, DEMNDI, DSUP, DURABL, GASHOL, HOGS, DJEMND, JLVSUP, JMACSU, LVSUPI, MACINC, MACROI, MACSUP, PLANT, PLTRY, PQEQI, PRVSTK, SAGIN, SHEEP, UPLAG.

CBLSX Section: DETAIL.
Contents: Outputs of the Livestock Supply component--livestock production, losses, feed requirements.
Size: 692 words.
Subroutines: AFINPT, CURRNT, DSUP, FDSDLS, JAGFIN, JLVSUP, LVDAT, LVFEED, LVOUT, UPLAG.

CBMEXS Section: DETAIL.
Contents: Outputs of Macroeconomy to supply components--wage and interest rates.
Size: 2 words.
Subroutines: CATTLE, EXMOD, HOGS, JLVSUP, JMACIN, JMACMO, JSAGIN, MACINC, MACINV, MACLAG, MACMON, MACROI, MACSUP, PLTRY, PRVSTK, SAGIN, SHEEP, UPLAG.

CBMEXX Section: DETAIL.
Contents: Outputs of Macroeconomy to exchange components--consumption expenditures and GNP.
Size: 3 words.
Subroutines: CNSACC, HUMCNS, JDEMND, JHUMCN, JMACMO, MACINC, MACINV, MACLAG, MACMON, MACROI, PRVSTK.

CBNAX Section: DETAIL.
Contents: Outputs of the Nonagricultural Supply component--nonagricultural production, value added, wages.
Size: 4 words.
Subroutines: DSUP, INDUS, JDEMND, JNAGSU, NAGSUP.

CBOBJ Section: DETAIL.
Contents: Price-quantity equilibrium objective function variables and weights.
Size: 105 words.
Subroutines: PQEINV, PQEQUS, USDATA.

CBPQX Section: DETAIL.
Contents: Domestic prices, price indices, price index weights.
Size: 180 words.
Subroutines: AFINPT, ALCBEV, BUFSTK, CNSACC, CRPPOL, CURRNT, DAIRYM, DURABL, GASHOL, HUMCNS, INDUS, JAGFIN, JDEMND, JHUMCN, JLVSUP, JMACIN, JMACMO, JMACSU, JNAGSU, JPOLAD, JPRICI, JSAGIN, LVFEED, LVIN, LVOUT, MACINC, MACINV, MACLAG, MACMON, MACSUP, NAGSUP, OUTPQE, POLADJ, PQEINV, PQEQI, PQEQUS, PRDPRC, PRICIN, PRVSTK, SAGIN, SUPUSA, UPLAG, USDATA.

CBRDX Section: DETAIL.
Contents: Outputs of the Resource Development component--constraints on total and intensive cropland.
Size: 33 words.
Subroutines: PLANT, RESDEV.

CMMN Section: IIASA.
Contents: Time and record counters, calibration period.
Size: 11 words.
Subroutines: EXCHNG, INIT, INTERP, REST, SUPPLY, USWRLD.

CONST Section: IIASA.
Contents: Predetermined parameters for country exchange modules--financial policy hierarchy, linear expenditure system parameters, trade balance parameters, predetermined supply and public consumption.
Size: 3,811 words.
Subroutines: BALDEF, CHECK, CONTRI, DISY, DWDCAL, EXCHNG, EXCHRD, EXIASN, EXUSA1, EXUSA2, EX100, INMAT, INPQE, INREAD, INR100, INTBAL, INTERP, INVERT, JACNEW, JPOLAD, MUADJ, ORDER1, OUTPQE, PIVCOM, PIVFIN, POLADJ, PRODIS, REORD, SELIN, STOCK5, SUPFAP, SUP100, WPREP, WRIT3, WVAL, XR100.

CONTRL Section: DETAIL.
Contents: Control parameters of the U.S. detailed model.
Size: 39 words.
Subroutines: AFINPT, AFOUT, AGFIN, BUFSTK, CATTLE, CNSACC, CONTRI, CPROD, CRPIN, CRPPOL, CRPSUI, CURRNT, CYIELD, DEMAND, DEMNDI, DEMOG, DSUP, DURABL, EXMOD, EXUSA2, FDSDLS, FINPOL, FASHOL, HOGS, HUMCNS, INDUS, INPQE, JAGFIN, JDEMND, JDSUP, JDUMCP, JEXDMW, JEXMOD, JHUMCN, JLVSUP, JMACIN, JMACMO, JMACSU, JNAGSU, JPOLAD, JPRICI, JPRICW, JSAGIN, LVFEED, LVIN, LVOUT, LVSUPI, MACINC, MACINV, MACMON, MACROI, MACSUP, NAGSUP, OUTPQE, PLANT, PLTRY, POLADJ, PQEINV, PQEQI, PQEQUS, PQKWN, PRDPRC, PRICIN, PRVSTK, RESDEV, RESDVI, SAGIN, SHEEP, SUPUSA, TRADE, UPLAG, USDATA, USFISH, USINIT.

CONVRT Section: DETAIL.
Contents: World prices and U.S. net excess demand converted to the 10 and 19 international commodities.
Size: 48 words.
Subroutines: EXUSA2, PRICIN.

CRPDAT Section: DETAIL.
Contents: Parameters and coefficients of the Crop Supply equations.
Size: 299 words.
Subroutines: CPROD, CRPIN, CRPPOL, CRPSUI, CSDAT, CYIELD, DEMNDI, PLANT, PQEQI, UPLAG.

CSXVAR Section: DETAIL.
Contents: Dummy and exogenous variables of Crop Supply.
Size: 6 words.
Subroutines: CRPIN, PLANT.

DEMO Section: INDIA.
Contents: Demographic variables.
Size: 14 words.
Subroutines: DISY, EXPECT, SUP100.

ENDO Section: INDIA.
Contents: Miscellaneous endogenous variables of India supply.
Size: 362 words.
Subroutines: DISY, SUP100.

ENDOG Section: DETAIL.
Contents: Endogenous variables of Agricultural Finance--agricultural input demands and investments.
Size: 20 words.
Subroutines: AFINPT, AFOUT, CURRNT, DURABL, JAGFIN, MACINV.

EXFARM Section: DETAIL.
Contents: Exogenous farm variables for Agricultural Finance.
Size: 9 words.
Subroutines: AFDAT, AFINPT, CURRNT, DURABL, OUTPQE.

EXPRIC Section: DETAIL.
Contents: Annualized durables prices and depreciation rates for Agricultural Finance.
Size: 6 words.
Subroutines: AFDAT, AFINPT, CURRNT, DURABL, JAGFIN, UPLAG.

FAPDAT Section: INTERM.
Contents: Debug variables added by IIASA/FAP.
Size: 70 words.
Subroutines: FAMUSI.

DPROC Section: DETAIL.
Contents: Food processing variables and parameters.
Size: 37 words.
Subroutines: ALCBEV, DAIRYM, DSUP, INDUS, JDEMND, JDSUP, USDATA.

FEDCO Section: DETAIL.
Contents: Parameters and coefficients of the Feed subcomponent equations.
Size: 62 words.
Subroutines: JLVSUP, LVDAT, LVFEED.

FEDLAG Section: DETAIL.
Contents: Lagged variables of the Feed subcomponent.
Size: 4 words.
Subroutines: LVFEED.

FEDNV Section: DETAIL
Contents: Internal variables of the Feed subcomponent--demand for feed.
Size: 8 words.
Subroutines: JLVSUP, LVFEED, LVOUT.

FLOWS Section: DETAIL.
Contents: Flow variables of Agricultural Finance--receipts, expenditures, sources and uses of funds.
Size: 56 words.
Subroutines: AFDAT, AFOUT, CURRNT, DURABL, JAGFIN, OUTPQE, PRINTI, PRSAUF, UPLAG.

FORM Section: DETAIL.
Contents: Capital formation variables in Agricultural Finance.
Size: 34 words.
Subroutines: CURRNT, DURABL, PRFORM.

GAINS Section: DETAIL.
Contents: Capital gains variables in Agricultural Finance.
Size: 10 words.
Subroutines: CURRNT, DURABL, PRGAIN.

GASSP Section: INTERM.
Contents: Endogenous and exogenous variables and historical series of the intermediate U.S. model; parameters of GASSP data input procedure.
Size: 11,000 words.
Subroutines: EXSUP, BKDATA, FAMUSI, FAMUSR, FEED, SUPEX, SUP231.

GECON Section: DETAIL.
Contents: In Agricultural Finance, constant dollar capital stocks, and inputs from the Crop and Livestock Supply components.
Size: 11 words.
Subroutines: AFDAT, AFINPT, AFOUT, AGFINI, CURRNT, DURABL, JAGFIN, MACINV, MACROI, UPLAG.

GEN Section: IIASA.
Contents: World model variables--world prices, net excess demand, trade balance, Jacobian; international policy variables.
Size: 958 words.
Subroutines: CALCUL, EXCESS, EXCHNG, EXIASN, EXUSA1, EXUSA2, EX041, EX100, EX777, GOAL1, GOAL4, GOAL5, GOAL6, GOAL7, INTBAL, INTERP, INTRD, LIGNE, OUTPQE, POSTEX, REST, TRANSC, XR100.

HOGCO Section: DETAIL.
Contents: Coefficients and parameters of the Hogs subcomponent.
Size: 29 words.
Subroutines: HOGS, JLVSUP, LVDAT.

HOGLAG Section: DETAIL.
Contents: Lagged variables of the Hogs subcomponent.
Size: 12 words.
Subroutines: CURRNT, HOGS, JLVSUP, LVFEED, LVSUPI, UPLAG.

HOGNV Section: DETAIL.
Contents: Internal variables of the Hogs subcomponent.
Size: 10 words.
Subroutines: CURRNT, HOGS, JLVSUP, LVFEED, LVOUT, UPLAG.

INTC Section: INDIA.
Contents: Intermediate consumption demand.
Size: 10 words.
Subroutines: DISY, SUP100.

INTEG Section: IIASA.
Contents: Integer variables of the domestic exchange algorithm--switches, counters, pointers, indicators.
Size: 187 words.
Subroutines: BALDEF, BUFSTK, CHECK, DWDCAL, EXCESS, EXIASN, EXUSA1, EXUSA2, EX041, EX100, EX777, INMAT, INREAD, INR100, INVERT, JACNEW, JDEMND, JEXDMW, JEXMOD, JPOLAD, JPRICW, ORDER1, PIVCOM, PIVFIN, REORD, REST, SELIN, STOCK5, SXR777, WPREP, WRIT3, WVAL.

KEEP Section: IIASA.
Contents: During international equilibrium algorithm, stores current best values of world prices and goal function.
Size: 21 words.
Subroutines: EXCHNG, GOAL1, GOAL7.

LINK Section: INTERM.
Contents: Run mode.
Size: 1 word.
Subroutines: EXSUP, SUPEX, SUP231.

LMBCO Section: DETAIL.
Contents: Parameters and coefficients of the Sheep subcomponent.
Size: 18 words.
Subroutines: JLVSUP, LVDAT, SHEEP.

LMBLAG Section: DETAIL.
Contents: Lagged variables of the Sheep subcomponent.
Size: 10 words.
Subroutines: LVSUPI, SHEEP, UPLAG.

LMBNV Section: DETAIL.
Contents: Internal variables of the Sheep subcomponent.
Size: 6 words.
Subroutines: JLVSUP, LVOUT, LVSUPI, SHEEP, UPLAG.

LOGA Section: IIASA.
Contents: Logical variables and switches of the domestic exchange equilibrium algorithm.
Size: 17 words.
Subroutines: CHECK, EXCHNG, EXIASN, EXUSA1, EXUSA2, EX100, GOAL1, GOAL7, INMAT, MUADJ, ORDER1, PIVCOM, PIVFIN, REORD, REST, SELIN, STOCK5, WPREP, WVAL.

LVXVAR Section: DETAIL.
Contents: Exogenous variables of the Livestock Supply component--livestock prices and dummy variables.
Size: 21 words.
Subroutines: CATTLE, CURRNT, HOGS, JLVSUP, LVFEED, LVIN, PLTRY, SHEEP, UPLAG.

MACDAT Section: DETAIL.
Contents: Parameters and coefficients of the Macroeconomy component.
Size: 78 words.
Subroutines: JMACIN, JMACMO, JMACSU, MACINC, MACINV, MACMON, MACROI, MACSUP, MEDATA.

MACVAR Section: DETAIL.
Contents: Lagged and current internal variables of the Macroeconomy component.
Size: 66 words.
Subroutines: JMACIN, JMACMO, JMACSU, MACINC, MACINV, MACLAG, JACMON, MACROI, MACSUP, NAGSUP, PQEQI, PQEQUS.

MAX Section: OTHER.
Contents: Resource allocation variables.
Size: 77 words.
Subroutines: MAXIM, SUPFAP, SUP777.

MISC Section: INTERM.
Contents: Parameters for data input.
Size: 5 words.
Subroutines: BKDATA, FAMUSI.

MOTRA Section: IIASA.
Contents: Linear transformation switches for domestic exchange modules.
Size: 70 words.
Subroutines: BALDEF, EXIASN, EXUSA1, EX100, INMAT, JACNEW, PIVCOM, POLADJ, WRIT3.

NEW Section: IIASA.
Contents: In the international equilibrium algorithm, stores the index of the commodity furthest from equilibrium.
Size: 1 word.
Subroutines: GOAL1, GOAL5, GOAL7, LIGNE.

NONSIM Section: DETAIL.
Contents: Beginning stocks and other predetermined parts of current domestic supply.
Size: 15 words.
Subroutines: ALCBEV, DAIRYM, DSUP.

PARDET Section: IIASA.
Contents: Parameters of national financial, stocks, trade, and price policies for the domestic exchange modules.
Size: 1,196 words.
Subroutines: BUFSTK, CONTRI, DISY, EXIASN, EXUSA1, EXUSA2, EX100, INPQE, INREAD, INR100, INTBAL, JEXMOD, JMACSU, JPOLAD, JPRICI, JPRICW, OUTPQE, POLADJ, PQEQI, PRDPRC, PRICIN, SUPFAP, SUP100, WRIT3.

PARDTU Section: DETAIL.
Contents: Initial values of U.S. financial, stocks, trade and price policy parameters.
Size: 1,229 words.
Subroutines: CONTRI, USDATA.

PFSTK Section: DETAIL.
Contents: Historical policy and free stocks, and parameters of the free stock equations.
Size: 101 words.
Subroutines: BUFSTK, DEMNDI, JDEMND, JEXDMW, PRVSTK, TRADE, USDATA.

PLTCO Section: DETAIL.
Contents: Parameters and coefficients of the Poultry subcomponent.
Size: 62 words.
Subroutines: JLVSUP, LVDAT, LVIN, PLTRY, PQEQI.

PLTLAG Section: DETAIL.
Contents: Lagged variables of the Poultry subcomponent.
Size: 26 words.
Subroutines: JLVSUP, LVIN, LVSUPI, PLTRY, PQEQI, PRICIN, UPLAG.

PLTNV Section: DETAIL.
Contents: Internal variables of the Poultry subcomponent.
Size: 17 words.
Subroutines: JLVSUP, LVFEED, LVOUT, PLTRY, UPLAG.

POLICY Section: IIASA.
Contents: Nutrition parameters for supply modules of standard FAP countries and India.
Size: 8 words.
Subroutines: SUPFAP, SUPPLY, SUP100.

POLPAR Section: IIASA.
Contents: Financial, trade, stocks, and price policy variables of national exchange modules.
Size: 564 words.
Subroutines: BALDEF, BUFSTK, CHECK, DISY, EXIASN, EXUSA1, EXUSA2, EX100, INMAT, INPQE, INREAD, INR100, INTBAL, JPOLAD, JPRICI, MUADJ, OUTPQE, PIVCOM, PIVFIN, POLADJ, PRICIN, PRVSTK, STOCK5, SUPFAP, SUP100, WRIT3.

PQDAT Section: DETAIL.
Contents: Base-year prices, and parameters, switches and unit conversion coefficients for prices and quantities.
Size: 838 words.
Subroutines: CNSACC, EXUSA2, HUMCNS, INDUS, INPQE, JDUMCP, JEXDMW, JHUNCN, JMACSU, JPRICI, JPRICW, JSAGIN, PQEQI, PRDPRC,

PRICIN, SAGIN, USDATA.

PRO Section: INDIA.
Contents: Feed demand, and procurement demand for wheat, rice and coarse grains.
Size: 13 words.
Subroutines: DISY, PRODIS, SUP100.

RANDIO Section: IIASA.
Contents: Record lengths and record pointers for direct access files.
Size: 15 words.
Subroutines: CALCUL, CRPPOL, CRPSUI, CYIELD, DEMOG, DEMNDI, EXCHNG, EXCHRD, EXIASN, EXREAD, EXUSA1, EXUSA2, EX041, EX100, EX777, FAMUSI, GOAL4, INIT, INPQE, INREAD, INR100, INTERP, INTRD, JEXMOD, JPOLAD, LVSUPI, MACINC, MACROI, OUTPQE PQEINV, PQEQI, PRICIN, PRVSTK, RESDEV, RESDVI, REST, SR100, SUPFAP, SUPPLY, SUPRES, SUP041, SUP100, SUPFAP, SUPPLY, SUPRES, SUP041, SUP100, SUP231, SUP777, TRAFO, USFISH, USINIT, XR100.

RAW Section: INDIA.
Contents: Initial raw product prices; and consumption, income, and taxes by income class.
Size: 211 words.
Subroutines: DISY, SUP100.

RDDATA Section: DETAIL.
Contents: Parameters and coefficients of the Resource Development component.
Size: 57 words.
Subroutines: RESDAT, RESDEV, RESDVI.

RDVAR Section: DETAIL.
Contents: Internal variables of the Resource Development component.
Size: 10 words.
Subroutines: RESDEV, RESDVI.

SAVE Section: INDIA.
Contents: GDP deflator, and savings function coefficients.
Size: 11 words.
Subroutines: DISY, SUP100.

SIZE Section: IIASA.
Contents: Parameters representing arbitrarily large and small values and certain constants.
Size: 6 words.
Subroutines: BALDEF, CALCUL, CHECK, EXCESS, EXCHNG, EXIASN, EXUSA1, EXUSA2, EX100, GOAL1, GOAL4, GOAL5, GOAL7, INMAT, INTBAL, INTERP, INVERT, JACNEW, MUADJ, NEWTON, PIVCOM, PIVFIN, PQEINV, PQEQUS, SELIN, STOCK5, TRANSC.

USPAR Section: INTERM.
Contents: Parameters and coefficients of the U.S. intermediate model.
Size: 1,208 words.
Subroutines: EXSUP, BKDATA, FAMUSI, FAMUSR, SUPEX, SUP231.

USPAR2 Section: INTERM.
Contents: Price equation parameters.
Size: 50 words.
Subroutines: EXSUP, BKDATA, FAMUSI.

USSUP Section: INTERM.
Contents: Internal variables of the U.S. intermediate model.
Size: 348 words.
Subroutines: EXSUP, FAMUSI, FAMUSR, SUPEX, SUP231.

USSUP2 Section: INTERM.
Contents: More internal variables of the U.S. intermediate model.
Size: 14 words.
Subroutines: EXSUP, FAMUSR, FEED, SUPEX.

USWORK Section: INTERM.
Contents: Contains the equivalent of IIASA COMMONs POLPAR, CONST, ACT, and PARDET, in that order, for use in the U.S. intermediate model.
Size: 5,984 words.
Subroutines: EXSUP, BKDATA, FAMUSI, SUPEX, SUP231.

VEES Section: DETAIL.
Contents: Stores vintages of capital investments in the Agricultural Finance component.
Size: 51 words.
Subroutines: AFDAT, CURRNT, DURABL.

WORK Sections: All except INTERM.
Contents: Depends on where used.
Size: 15,100 words, at most.
Subroutines: AGFINI, BALDEF, CALCUL, CHECK, CONTRI, CRPSUI, DATARW, DEMNDI, DISY, DWDCAL, DYNEPS, EXCHNG, EXIASN, EXPECT, EXUSA1, EXUSA2, EX041, EX100, EX777, GAUCHE, INIT, INMAT, INR100, INVERT, JACNEW, JAGFIN, JDEMND, JDSUP, JEXDMW, JEXMOD, JHUMCN, JLVSUP, JMACIN, JMACMO, JMACSU, JNAGSU, JPOLAD, JPRICI, JPRICW, JSAGIN, LOGDAT, LVSUPI, MACROI, MUADJ, NONAG, ORDER1, PIVCOM, PIVFIN, POLADJ PQEDER, PQEINV, PQEQI, PRODIS, RELRVN, REORD, RESDVI, REST, SELIN, SHIFT, SR100, STOCK5, SUPFAP, SUPRES, SUP041, SUP100, SUP777, SXR041, SXR777, TRAFO, USINIT, USWRLD, WPREP, WRIT3, WVAL.

XTR Section: INDIA.
Contents: Acreage allocation parameters and variables.
Size: 497 words.
Subroutines: AREAS, DISY, EXPECT, LOGDAT, NONAG, PRODIS, RELRVN, RESIDL, SHIFT, SUP100, TTAREA.

YEAR Section: IIASA.
Contents: Run control parameters.
Size: 74 words.
Subroutines: AFINPT, AGFINI, CRPPOL, CRPSUI, CYIELD, DEMNDI, DEMOG, DURABL, EXCESS, EXCHNG, EXCHRD, EXREAD, EXUSA2, EX041, EX777, FAMUSI, GOAL1, GOAL4, GOAL5, GOAL7, INIT, INTERP, JMACSU, LVSUPI, MACINC, MACROI, MACSUP, PQEQI, PRICIN, PRVSTK, RESDEV, RESDVI, REST, SR100, SUPPLY, SUPRD, SUPRES, SUPUSA, SUP041, SUP777, SXR041, SXR777, USFISH, USINIT, USWRLD, WRIT3, XR100.

BLOCK DATA Input

Some of the parameters, data series, and initial conditions are input via BLOCK DATA routines for the two U.S. models and the India model. The intermediate U.S. model and the India model have one each, called BKDATA and BKINDIA, respectively. The detailed U.S. model has six, as follows:

AFDAT -- associated with the Agricultural Finance component.
CSDAT -- associated with the Crop Supply component.
LVDAT -- associated with the Livestock Supply component.
MEDATA - associated with the Macroeconomy component.
RESDAT - associated with the Resource Development component.
USDATA - for the detailed U.S. model in general.

Direct Access Files

The USWRLD model uses eight direct access files for internal communication among the various sections and components. In addition, by saving them at various points during simulation (i.e., cataloging them), the simulation run may later be restarted at that point. For example, if the contents of these files resulting from model initialization are saved, the initialization phase of execution may be skipped. (See the discussion of the START file in Chapter 5, specifically the switches INT, IEX, and ICTR.) Also, it may be desirable to skip the expense of repeatedly running the model over the 1970-1980 period for policy analyses involving changes only over future periods. In this case, by saving all the direct access files following a run from 1970-1980, policy runs may then be "initialized" for simulations beginning in 1981. (See the discussion of the RESTART file on unit 1 in the next section.)

Each direct access file is described below in terms of its logical unit number, the nature of the information stored on it, and data on the number of records (NRECS) and the maximum number of words per record (NWORDS). The charts in Figure 5 in Chapter 3 indicate where in the program each is read and written.

Unit 3 This file is used only for the U.S. models. The intermediate model uses it to store annual results to be passed to its report writer (FAMUSP) at the end of the simulation run. The detailed model uses it to store historical time series needed during simulation over the historical period. In the detailed model, it is called LUHIST, which is given the value 3 in BLOCK DATA USDATA. For the intermediate model (switch ICALL(3)=1), NRECS=7*LENGTH+2, where LENGTH is the number of years of simulation, including the initial year, and NWORDS=280. For the detailed model, NRECS=400, and NWORDS=70.

Unit 8 This file stores equilibrium world prices and international policy variables to be passed to the country exchange and supply modules. NRECS=4 unless MODE=2 or 3 (market segmentation agreements), in which case NRECS=8. (See the next chapter for a description of the various run MODEs; NWORDS=118.

Unit 9 This file stores annual results of the non-U.S. country models and the world model to be passed to the IIASA/FAP report writer (OTHERP) at the end of the simulation run. NRECS=LENGTH*(NCR+IADD+2)+1, where NCR is the number of standard countries running, and IADD is the number of special countries running; NWORDS=NCOM*10+20, where NCOM is the number of commodities on the international market (10 or 19).

Unit 10 This file is the major means of communication between a country's supply and exchange modules--indeed the only means, except for the U.S. detailed model. The supply modules pass predetermined supplies and policy and demand function parameters to exchange, which passes back equilibrium results. It also enables the same COMMON areas to be shared by all the countries exchange and supply modules. NRECS=7*(NCR+IADD); NWORDS=1,262.

Unit 12 This file stores exogenous historical and projected world prices which are input to the model during simulation over the calibration period and during projections when MODE is less than zero. NRECS=LENGTH+2; NWORDS=NCOM.

Unit 13 This file stores each country's supply module data; this enables the same COMMON areas to be shared by all the countries' supply modules. NRECS=NCR+IADD, unless the intermediate U.S. model is running (ICALL(3)=1), in which case NRECS=NCR+IADD+8; NWORDS=1,445, unless the intermediate U.S. model is running in which case NWORDS=1,850, unless the India model is also running (ICALL(2)=1), in which case NWORDS=2,518.

Unit 14 This scratch file saves the contents of the WORK COMMON blocks while that space is used for other purposes. NRECS=2, unless the detailed U.S. model is running (ICALL(3)=2), in which case NRECS=3; NWORDS=1,270 or, if the detailed U.S. model is running, NWORDS=4,557.

Unit 15 This file is only used by the U.S. models. The intermediate model stores historical time series on it to be used by its report writer (FAMUSP). The detailed model does the same, but it does not currently have a report writer to use it. NRECS=3 and NWORDS=2,160 for the intermediate model (ICALL(3)=1); NRECS=4 and NWORDS=4,509 for the detailed model (ICALL(3)=2).

Coded Input and Output

Data input and model results are passed in and out via coded sequential files. These are described below in terms of the logical unit numbers, dataset names, and the nature and purpose of the information communicated. The subroutines in which they are read and written are also indicated. (See Chapter 3 for subroutine descriptions.)

Input Files

Unit 1 Name: RESTART.
Read: INIT.
Write: MAIN(USWRLD).
Contents: Indicators of final year of simulation. This file is read when MODE is greater than or equal to 8 in order to begin simulation in a year later than 1970, using direct access files created in a previous run from 1970 through the year prior to the desired starting year.

Unit 2 Name: START.
Read: INIT, RUNDOC, FAMUSP, OTHERP.
Contents: Run control parameters. See Chapter 5 for a description of their definition and use.

Unit 5 Names: INTDAT, DATS, DATN. These files are concatenated on unit 5 in this order, with a DATS and a DATN for each non-U.S. country running.
Read: INTRD, TRAFO, INREAD, SXR777, SR100, DATARW, INR100, SXR041.
Contents: INTDAT--initial world prices and international policy parameters.
DATS--country supply data.
DATN--country exchange data.

Unit 11 Name: EXPW.
Read: EXREAD.
Contents: Exogenous (historical) world prices.

Unit 16 Name: HUMCONS.
Read: HUMCNS, JHUMCN, JSHARE, SHARE. Used by the detailed U.S. model only.
Contents: Human consumption data.

Unit 17 Name: USINTDAT or USDETDAT.
Read: DATIN.
Contents: Country data for the U.S. intermediate (USINTDAT) or detailed (USDETDAT) models.

Unit 18 Name: NUMBER.
Read: RUNDOC.
Write: RUNDOC.
Contents: Cumulative run number.

Output Files

Unit 4 Name: U4.
Write: SUPFAP, SUP041, SUP100, SUP777. (Rewound in SUPPLY each year.)
Contents: Detailed output of supply modules of non-U.S. country models. See the section, "Description of Variables on Detailed Printout," in Appendix B and the sample output in Appendix C.

Unit 6 Name: U6.
Write: Many and diverse places. Also, this is the only output file of the U.S. models.
Contents: Debug and miscellaneous output; report writer output of the U.S. intermediate (FAMSUP) and other country (OTHERP) models. For the OTHERP output, see the section, "Description of Printout of Linked Run," in Appendix B and the sample output in Appendix C. The FAMUSP output has three basic parts: (1) a comparison of historical and simulated results with percent deviations (in the first, second, and third columns,respectively) for each of the 185 endogenous variables; (2) supply and utilization tables for the 20 U.S. commodities; and (3) equilibrium price, stock, and trade results for the U.S. aggregated to the 10 international commodities. See the section, "Description of Printout of Linked Run," in Appendix B. See Appendix C for a sample output.

Unit 7 Name: U7.
Write: Various places in the STOCK5 domestic equilibrium algorithm. (Rewound in EXCESS each international iteration.)
Contents: Debug output from exchange.

Unit 19 Name: SYSOUT.
Write: RUNDOC.
Contents: Run number and echo print of START file to accompany the control file listing.

Chapter 5

JOB SET-UP AND EXECUTION

This chapter describes how to set-up and run the USWRLD model system. It first defines the parameters on the START data file and then goes into detail on how to specify policy modes and country models. Finally, other START file parameters are discussed.

Contents of the START File

The START file is read from unit 2 by subroutine INIT in the USWRLD program, by the U.S. Intermediate Model report writer program (FAMUSP), and by other country models report writer program (OTHERP). The run control parameters and read formats (in parentheses) entered on the START file are:

YEARI, YEARF	(2F5.0)	Initial and final year of simulation.
NCR	(I3)	Number of standard country models.
IADD	(I3)	Number of special country models.
NCOM	(I3)	Number of international commodities.
MODE	(I3)	Policy mode.
NR	(I3)	Number of records per country written on direct access file 10.
NROUT(1-30)	(30I2)	Type of country exchange module, by country.
ICALL(1-30)	(30I2)	On-off switches for special country models, by country.
PREC	(F6.4)	Exchange equilibrium precision.
FNPREC	(F6.4)	Exchange goal function precision.
INT	(I3)	Switch for initialization of international policies.
IEX	(I3)	Switch for initialization of exogenous world prices.
ICTR	(I3)	Switch for initialization of country models.
ICALIB	(I3)	Length of calibration period for international equilibrium.

Modes and Models

There are seven modes of operation in the model, of which the user chooses one. They are:

MODE	Meaning
-2	For testing country supply modules in isolation, domestic and world prices are exogenous.
-1	For testing country models unlinked to the world system; world prices are exogenous.
0	Competitive equilibrium in the world market.
1	Agreement on international buffer stocks and a target band on world prices.
2	Market segmentation agreement (nonmember countries).
3	Market segmentation agreement (member countries).
4	Competitive equilibrium in the world market, with endogenous trade balance for at least one country.

In all modes except MODE 4, domestic equilibrium is defined for each country as that set of domestic prices, quantities, and financial policies which satisfy an exogenous target trade balance and price/quantity constraints. For MODE 4, the domestic equilibrium is simply a matter of finding price and corresponding quantities within specified bounds. See the next section for the use of MODE to indicate a restart.

The START file parameter NCR is the total number of standard country models to be run. It does not, however, specify which countries are running. The only way to do this is by the selection of country data files (DATS and DATN) concatenated on unit 5. The number of such data files must be NCR.

Special country models exist for the CMEA, India, the U.S., and China. The on-off switches for these four models are ICALL(1) through ICALL(4), respectively. Setting the switch to 0 (zero) turns the country model off. A value of 1 (one) turns them on in the cases of the CMEA, India, and

China. For the U.S., ICALL(3)=1 turns on the intermediate model, and ICALL(3)=2 turns on the detailed model. The parameter IADD should equal the number of special country models running. To avoid a possible error in the START file, IADD is computed in subroutine INIT based on the values of the ICALL switches, so that the value of IADD in the START file is irrelevant.

Initialization and Restart

Three sets of data files are used to initialize the USWRLD system to 1970. The first consists of the EXPW file, which is read (from unit 11 in subroutine EXREAD) to create the direct access file (unit 12) of exogenous world prices. This file is used when MODE=-2 or -1 and otherwise when simulating during the calibration period (defined by ICALIB). If the initial unit 12 is saved and catalogued, its initialization (execution of subroutine EXREAD and the EXPW file) may be omitted in later runs by setting the switch IEX to 0 (zero) in the START file.

The second set of initialization files is the INTDAT file, which is read (from unit 5 in subroutine INTRD) to create the direct access file (unit 8) of current values of world prices and international policy variables. If the initial unit 8 is saved and catalogued, its initialization (execution of subroutine INTRD and the INTDAT file) may be omitted in later runs by setting the switch INT to 0 (zero) in the START file.

The final set of data files initializes the country models. It consists of a DATS and a DATN file (on unit 5) for each non-U.S. country running, the USINTDAT file (on unit 17) for the intermediate U.S. model, and the USDETDAT file (on unit 17) for the detailed U.S. model. They are used to create the initial direct access files for the country models' exchange and supply

data--units 10 and 13 for all countries, and units 3 and 15 for the U.S.models. If these direct access files are saved and catalogued, then the country model initialization process may be omitted by setting the switch ICTR to 0 (zero) in the START file.

In addition, the model may be "initialized" to any year later than 1970 by running the system from 1970 through the year prior to the desired initial year and then saving all the direct access files at that point (units 3, 8, 9, 10, 12, 13, 14, and 15) as well as the RESTART file. The year indicator pointing to the desired initial year is automatically saved by the system on the RESTART file (unit 1). Starting the model at such a later year is called a "restart" and is indicated by setting the value of MODE to 10 (ten) greater than the desired policy mode (indicated in the section above). Thus, MODE would take on a value between 8 and 14. YEARI must still be 1970, however.

Other START File Parameters

YEARI and YEARF are self-explanatory. As mentioned above, YEARI must always be 1970 since initialization data files only exist for 1970.

The number of commodities on the international market, NCOM, must be 10, again since the data files are only set up for that commodity level. The U.S. detailed model, however, is capable of operating at the 19-commoditiy level IIASA/FAP has identified.

NR is self-explanatory. The way the program is currently set up, NR must always be 7.
The type of exchange module, NROUT, is obsolete and is not used anywhere in the model.
PREC and FNPREC are tolerances used by the international equilibrium algorithm. PREC is the tolerance on the deviation of scaled excess demands from zero, expressed for each commodity as a proportion of world supply. FNPREC is the tolerance on unscaled net excess demands, expressed as a percent of world supply.

Finally, ICALIB specifies the number of years of the calibration period. This means that, for MODE greater than or equal to zero, the rest-of-world consumption is determined so as to soak up the excess demand of the countries running. This makes equilibrium world prices equal to exogenous (presumably historical) world prices with only one iteration through the country models. ICALIB=0 means only 1970 is used to calibrate the rest-of-the-world, and world prices are endogenous thereafter.

Chapter 6

FURTHER MODEL AND PROGRAM DEVELOPMENT

Avenues for model improvement and expansion are suggested in four areas: the intermediate and detailed U.S. models, a North America model, and other country models.

The Intermediate U.S. Model

The crop and livestock supply and feed demand components of the intermediate U.S. model are taken directly from the MSU Agriculture Model [Mitchell and Christensen, 1981]. In so far as these components are improved and updated at Michigan State University and collaborative contacts are maintained between the modeling teams at MSU and in the Economic Research Service, the intermediate model can be similarly kept up to date and improved. In particular, Bruce Gardner of the University of Maryland, in his perceptive critique of the model, has strongly recommended a respecification of the commodity program policy variables and a consequent reestimation of the supply equations, and the MSU model team is planning to undertake this task. Other components, most notably human consumption and resource development (the latter having been adapted from the detailed model), will have to rely on efforts within ERS for continued maintenance.

This raises an important issue facing ERS decisionmakers. That is, it may not be feasible or desirable to maintain two relatively distinct U.S. models to interact with the USWRLD system. While a simplier, more aggregated model than the detailed model is desirable for analyses not

focusing so heavily on the U.S., a simplified version of the detailed model would, in the long-run, be easier to maintain than an independent model.

The Detailed U.S. Model

The overriding developmental need with respect to the detailed U.S. model is its integration into the regular research and analysis work of ERS. Preliminary steps have been taken to partially accomplish this by merging the crop and livestock supply and stock demand components with those of the ERS FAPSIM model. Much remains to be done to complete this merger--organizationally as well as in modeling and programming. This would then ensure that, as FAPSIM is improved and updated, so would be the detailed model.

Substantively, the crop supply component of the detailed model, including the commodity program policy variables, has been taken almost directly from that of the intermediate model, whereas FAPSIM offers the advantage of more detail and currency in the specification of the commodity programs and their impacts on land allocations and yields. Furthermore, the regional disaggregation of FAPSIM (currently underway) will be able to interface with the regional version of the detailed model's resource development component (land availability). In another area, the projection of stock demand can be improved for purposes of intermediate-term policy analysis in that FAPSIM disaggregates the three categories of policy stocks--those owned by the CCC, those outstanding under loan, and those in farmer-held reserves.

Similar steps need to be taken with respect to continued maintenance and development of other model components, such as human consumption, macroeconomy, food processing and industrial demand, demography, and resource development. While these components are satisfactory at present, they will quickly become obsolete unless responsibility for them is placed in appropriate places in ERS, either through an expanded concept of FAPSIM or elsewhere.

A North America Model

A Canadian modeling project is underway (with a team headed by Bruce Huff of Agriculture Canada), similar to the USWRLD project, to develop a Canadian national model linkable to the IIASA/FAP system and to transfer that system to Agriculture Canada. Because of the importance of the U.S. and Canada to each other with respect to trade in both agricultural and nonagricultural commodities and with respect to the money and financial sectors, great mutual policy analysis benefits can be derived from a modeling collaboration to endogenize these unique, traditional relationships. Preliminary discussions have been held between the two modeling groups, and it appears feasible to link the exchange modules of the U.S. and Canada detailed models in the simultaneous solution to capture these relationships explicitly rather than ignoring them in the anonymousworld market of the IIASA/FAP system. From the standpoint of the international linkage algorithm, then, the U.S. and Canada would appear as a single "country" generating a combined net trade with the rest of the world.

The U.S. has similar extensive and traditional trading relationships with Mexico to the south. Thus, it may be desirable to investigate the feasibility of collaborating with the group developing the Mexico national model for the IIASA/FAP system to effect a linkage with that model as well.

Other Country Models

The above discussion with respect to the intermediate and detailed U.S. models applies to the IIASA/FAP models of other countries as well. That is, if they are not to become obsolete, they must be organizationally placed within the regular research and analysis work of ERS. This is particularly important given the fact that the IIASA Food and Agriculture Program is phasing out and, in any case, ERS needs to be able to develop the models in ways consistent with its own policy analysis needs and those of its clients.

Appendix A

SUPPORTING DATA BASES

Several data bases have been created and/or tapped in support of the various country models in the USWRLD system. These are listed and briefly described below by associated model.

1. Intermediate U.S. Model. It relies on the collection of agricultural economics data bases residing at Michigan State University. Its input data file (described in Chapter 4) is created from those data bases. These data bases were created and are maintained to support the MSU Agriculture Model and other work of the Department of Agricultural Economics at MSU.

2. Detailed U.S. Model. The crop supply and agricultural finance components of this model are estimated from the agricultural economics data bases at MSU mentioned above. Also, the parts of the data input file for the model (described in Chapter 4) relating to these components are created from those data bases. A separate data base, available in ERS, has been put together from those compiled in the development of the livestock supply, human consumption, resource development, macroeconomy, and stock demand components. The rest of the model's data input file is created from this data base.

3. Other Country Models. An extensive data base has been compiled at IIASA from data tapes made available to the Food and Agriculture Program by the FAO, the ILO, and the USDA. Further, IIASA/FAP has developed software to access this data base and aggregate the information stored there to its own country and commodity definitions and to use these aggregations in estimation and in creating the data input files necessary to run the models (described in Chapter 4).

Appendix B

IIASA BASIC LINKED SYSTEM OUTPUT DESCRIPTION

This appendix reproduces two documents written at IIASA describing the output generated by the IIASA/FAP model system. The first, "Description of Variables on Detailed Printout," describes the information written to unit 4 each year from each country's supply module (except the U.S.). The second, "Description of Printout of Linked Run," describes the output of the two report writers--FAMUSP for the U.S. intermediate model, and OTHERP for the other country and world models. Samples of all these outputs are presented in Appendix C.

DESCRIPTION OF VARIABLES ON DETAILED PRINTOUT

(for Linked or Unlinked Runs)

1) **(Country name): Year 1970**

GDP = gross domestic product of total economy at current prices, prices of 1970, and its annual growth rate. (The growth rate refers to two consecutive years.)

GDPA = gross domestic product of agriculture at current prices, prices of 1970, and its annual growth rate (see Fischer and Frohberg, 1981*)

GDPNA = gross domestic product of nonagriculture at current prices, prices of 1970, and its annual growth rate. (see Fischer and Frohberg, 1981*)

trade deficit = no explanation needed

tax = see Fischer and Frohberg, 1981*, section 1.3

Tariff = see Fischer and Frohberg, 1981*, section 1.2

phi(corr) = (1 − tax)/GDP

phi(orig) = 1 − tax rate (as calculated in exchange routine)(see Fischer and Frohberg, 1981, section 1.3 − there it is called Φ)

GDP/CAP (US$ 1970) = GDP per capita in US$ at 1970 prices

Cal/Cap/Day = kilocalories per capita and day

Gr. Protein/Cap/Day = gross protein per capita and day

pipya = producer price index of agricultural commodities

pipyn = producer price index of nonagricultural commodities

*Fischer and Frohberg (1981) contains the main relationships used in the model.

pipyt = producer price index of all commodities

pifood = retail price index of agricultural commodities

2) Supply and Demand

nr = index of commodity (see Table 1)

Table 1. Commodity List – Condensed Version

Condensed Model			Detailed Model	
No.	Commodity	Units of Measurement	No.	Commodity
1	Wheat	10^3 tons	1	Wheat
2	Rice, milled	10^3 tons	2	Rice, milled
3	Coarse grains	10^3 tons	3	Coarse grains
4	Bovine and ovine meats	10^3 tons, carcass weight	7	Bovine and ovine meats
5	Dairy products	10^3 tons fresh milk equiv.	10	Dairy products
6	Other animal products	10^3 tons protein equiv.	8 9 13	Pork Poultry and eggs Fish
7	Protein feeds	10^3 tons protein equiv.	5	Protein feeds
8	Other food	mill. US$ in 1970	4 6 11 12 14 15	Oils and fats Sugar products Vegetables Fruits and nuts Coffee Cocoa, tea and their products
9	Nonfood agriculture	mill. US$ in 1970	17 18	Clothing fibers Industrial crops
10	Nonagriculture		19	Nonagriculture

ty = index indicating the type of policy instrument applying to the exchange process

Supply = production (net of seed and waste) plus ending stock of previous year

Hum. Con. = human consumption

Feed = feed used by all animals

Int. Cons. = intermediate consumption defined as that part of the commodity which is used in the other sector, i.e. if it is an agricultural product, then it is used in nonagriculture.

Gov. Dem. = government demand

Stock = ending stocks

Demand = human consumption + feed + intermediate consumption + government demand + ending stock

net trade = supply – demand

Dom. Price = domestic equilibrium price at retail level (called $P_t^E(i)$ in Fischer and Frohberg, 1981) Their respective dimensions are (nc = national currency):

Commodity Nr.	Unit of Measurement
1,2,3,4,5	thousand nc per ton (metric) of the corresponding product
6,7	thousand nc per ton protein equivalent of the corr. product
8,9,10	nc per US$ – 1970

"Cons/Cap" = human consumption per capita; measures used are as follows:

Commodity Nr.	Unit of Measurement
1,2,3,4,5	kg of product per capita
6,7	kg of protein equivalent per capita
8,9,10	US $ 70 per head

SSR = self-sufficiency ratio (supply divided by demand)

3) **Price Relations**

For dimension of the various prices see under 2 above.

Foreign currency = US $
incl. processing = prices at retail level
raw material = prices at producer level
des. pr. = desired (or target) prices, domestic
dom. pr. = domestic prices (equilibrium)
Wm. pr. = world market prices (equilibrium)

Note: (i) by assumption $PRM_9 = 0$, i.e. there is no processing of commodity 9.
(ii) by definition $PRM_{10} = 0$, i.e. there is no processing of commodity 10.

4) Results of Allocation Model

Note: Everything here relates to the agricultural sector only.

Cap = capital stock (in mill. US$ 1970)
Tla = labor force (in thousands)
Tfnet = fertilizer net of that amount used for roughage (in thousand mt)
Sca = shadow price of capital (nc per US$ 1970)
Sla = shadow price of labor (thousand nc per capita)
Stf = shadow price of fertilizer (nc per kg pure nitrogen)*

Shadow prices:

The 8 numbers below this line indicate the shadow prices of constraints (lower or upper constraints) on production of the corresponding commodity.

Note: The indices of the commodities differ from those referred to in Table 2 of Fischer and Frohberg (1980) and are listed below:

Nr = index of commodities in supply model

1 = wheat (in thousand m.t.)
2 = rice (in thousand m.t.)
3 = coarse grain (in thousand m.t.)
4 = protein feed of crop origin (in thousand m.t. protein equivalent)
5 = other food of crop origin except oil of crop origin, i.e. sugar, fruits, vegetables, nuts, coffee, cocoa and tea (in mill. US $ at 1970 prices)
6 = nonfood agricultural products (in mill. US $ at 1970 prices)
7 = meat and milk of bovine and ovine animals (in thousand m.t. protein equivalent)
8 = products of all other animals (pig, poultry, fish) (in thousand m.t. protein equivalent)

Implied prices:

The 8 numbers below this line indicate the prices of the corresponding commodity which were necessary in order to obtain an unconstrained solution identical to the constrained solution.

*In the case of New Zealand pure phosphate is used instead of pure nitrogen.

Price = expected (producer) price
Output = net production, i.e. seed and waste are already subtracted
Capital = capital stock used for producing corresponding commodity (mill. US$ – 1970)
Labor = Labor used for producing corresponding commodity (thousands of persons)
Fertilizer = pure nitrogen* used for producing corresponding commodity (in thousand m.t.)
CAP/UNIT = Capital stock per unit of commodity (in thousand US$ – 70 per dimension of commodity)
LAB/UNIT = labor per unit of commodity (person per dimension of commodity)
FERT/UNIT = fertilizer (pure nitrogen)* per unit of commodity (metric tons per dimension of commodity)

Note: The results of the allocation model are always used in the exchange process of the following year.

5) **Sectoral Data on Endowments, Resources**

Supply of each commodity according to the exchange commodity list is given:

Sector 1 = agriculture
Sector 2 = nonagriculture

Labor and capital are the inputs used in each of the sectors. Note that capital is now expressed in million national currency at 1970 prices.

Note that the supply data appear again for the following year under section 2.

$$\text{pratio}(i) = \frac{\text{producer price } (i)}{\text{world market price } (i) \text{ at national currency level}}$$

i = commodity index (see Table 1 above)

ideb = 1 first line: target per capita consumption of agricultural population, i.e., of income class 1

if "ideb = 2" does not appear on the printout, then the line represents target per capita consumption for whole population

*In the case of New Zealand pure phosphate is used instead of pure nitrogen.

second line; third number: total target expenditure for agricultural products; the other numbers are some results of intermediate calculations.

ideb = 2 The same as ideb = 1 but for income class "rural population". If ideb = 2 is not printed then there is only one income class of the corresponding country.

ideb = 4 some results of intermediate calculations

ideb = 5 marginal expenditure shares for the 10 commodities, see Table 1 for the index

8) Planned Supply for Year

This section is self-explanatory. Note that capital and investment data are expressed in million national currency.

REFERENCES

Fischer, G. and K. Frohberg (1980) Simplified National Models – the Condensed Version of the Food and Agriculture Model System of the International Institute of Applied Systems Analysis. WP-80-56. Laxenburg, Austria: International Institute for Applied Systems Analysis.

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DESCRIPTION OF PRINTOUT OF LINKED RUN

FAP BASIC LINKED SYSTEM

1) MODEL RESULTS FOR WORLD MARKET

1.1) WORLD MARKET PRICES

These prices are in US $ at raw material level. The column headed "Price" contains the price of the nonagricultural product. The prices are expressed in the following way:

Commodity Number	Price
1,2,3,4,5	thousand US$ per ton (metric) of the corresponding product
6,7	thousand US$ per ton (metric) protein equivalent of the corresponding product
8,9,10	US$ per US$ - 70

The reader is reminded that these prices are "real" prices in the sense that they sum up in each year to a value which is constant over all years.

1.2) WORLD PRODUCTION

This section contains total production of each commodity according to the commodity specification (condensed version) given in Table 1. The units of measurement are listed in Table 1 as well.

1.3) WORLD EXPORTS

This section contains the sum of the net exports of all countries. Units of measurement are according to Table 1.

It should be noted that these are net exports, while gross exports are usually listed in statistical yearbooks. The fact that the raw material content of all processed goods is also included in our results makes a comparison of our data with those listed in statistical sources more difficult.

1.4) WORLD MARKET RELATIVE PRICES

Since only the price structure and not the price level is important in the model system, the world market price relative to that of the nonagricultural commodity is listed. This, we hope, will give a better insight into the change in the price structure over time.

Table 1. Commodity List – Condensed Version

Condensed Model			Detailed Model	
No.	Commodity	Units of Measurement	No.	Commodity
1	Wheat	10^3 tons	1	Wheat
2	Rice, milled	10^3 tons	2	Rice, milled
3	Coarse grains	10^3 tons	3	Coarse grains
4	Bovine and ovine meats	10^3 tons, carcass weight	7	Bovine and ovine meats
5	Dairy products	10^3 tons fresh milk equiv.	10	Dairy products
6	Other animal products	10^3 tons protein equiv.	8 9 13	Pork Poultry and eggs Fish
7	Protein feeds	10^3 tons protein equiv.	5	Protein feeds
8	Other food	mill. US$ in 1970	4 6 11 12 14 15	Oils and fats sugar products Vegetables Fruits and nuts Coffee Cocoa, tea and their products
9	Nonfood agriculture	mill. US$ in 1970	17 18	Clothing fibers Industrial crops
10	Nonagriculture		19	Nonagriculture

2) PLOTS

The plots show the world market relative prices for all agricultural commodities and the price of the nonagricultural commodity as calculated.

3) COUNTRY-SPECIFIC LISTING FOR ALL COUNTRIES EXCEPT INDIA AND THE US

3.1) GENERAL INDICATIONS

GDP70, GDPA70, and GDPNA70 are the gross domestic product for the total economy, the agricultural sector, and the nonagricultural sector, respectively. They are calculated at constant prices and are expressed in million national currency (nc).

Tr.Def70 = trade deficit at 1970 prices measured in million nc. At the current stage of the work it is exogenously specified.

PA/PNA = the ratio of the agricultural price index to that of nonagriculture. Both the agricultural and the nonagricultural price index are set equal to one in 1970.

PNA = price index of the nonagricultural sector

Ag.Cap.	= capital stock of the agricultural sector expressed in million nc of 1970
Nag.Cap.	= capital stock employed in nonagricultural production, expressed in million nc of 1970
Fert.	= fertilizer used in agriculture. For all countries referred to in this section except New Zealand pure nitrogen in 1000 mt is used. Pure phosphate is used in the case of New Zealand.
Exch.Rte.	= exchange rate, nc per US $. Note that the exchange rate does not effect the result of the model because of the homogeneity requirement imposed.
Pop.	= population in thousands
Tla.	= total labor force engaged in agricultural production, measured in thousands of persons
Tlna	= total labor force employed in the nonagricultural sector, measured in thousands of persons
Cal/Cap	= kilocalorie intake per capita and day
Prot/Cap	= protein intake per capita and day

3.2) LISTING OF COMMODITY-SPECIFIC RESULTS FOR AGRICULTURAL COMMODITIES

Prod.Pr.	= price as expected by the producer to prevail in the year indicated. The prices are expressed in the same units as the world market prices but in national currency instead of US $. Please refer to the description in Section 1.1.
Supply	= net production plus beginning stocks, with net production being equal to gross production minus seed and waste.*
Net. Exp.	= supply minus demand; i.e. net export
Ret. Pr.	= equilibrium price at retail level which is equal to the (equilibrium) raw material price plus the (equilibrium) value of processing, distribution and marketing of the corresponding commodity.
Demand	= total domestic disappearance
Hum.Cons.	= human consumption
Int. Cons.	= intermediate consumption; it is this amount which the nonagricultural sector uses to produce the nonagricultural commodity
Feed	= feed use
SSR	= self-sufficiency ratio; supply divided by demand

Note: all quantities are measured as indicated in Table 1.

*Depending on the country and commodity, seed and waste may account for up to 10 percent of gross production. This figure is indicated by the data set used to construct the model.

3.3) LISTING OF RESULTS OBTAINED FOR THE NONAGRICULTURAL COMMODTIY

Price = equilibrium price

Note: By definition there is no processing, distribution or marketing of the nonagricultural commodity.

Supply = see above under 3.2.

Net.Exp. = see above under 3.2.

Investm. = total investment

See other columns as defined under 3.2.

4) LISTING OF RESULTS FOR INDIA

4.1) EXPLANATION OF GENERAL INDICATORS

Note: Always ignore the figures corresponding to the year 1970.

RPOPNA: population in rural nonagricultural sector

GDPA70: agricultural gross domestic product (GDP) at 1970–70 prices

GDPNA70: nonagricultural GDP at 1970–71 prices

TR.DEF70: trade deficit at 1970–71 prices

PA/PNA: ratio of the agricultural price index to that of nonagriculture

SECITT: sectoral income terms of trade between nonagriculture and agriculture

SECMGR: sectoral migration from agriculture to nonagriculture (in thousands)

PROT/CAP: average of per capita protein consumption

CAL/CAP: average of per capita calorie consumption

POPULN: total population in millions

GAMA: share of rural nonagriculture in the total nonagriculture (x 1000)

RPOP: total rural population in millions

UPOP: total urban population in millions

INVEST: total gross investment in

REGITT: regional income terms of trade between urban and rural areas

4.2) EXPLANATION FOR THE LABELS IN THE SECTIONS ON DAILY CALORIE INTAKE, PROTEIN CONSUMPTION AND CLASSWISE POPULATION

There are ten income classes in the model – 5 in rural and 5 in urban.

ex: R.cl.5 is the top income class in rural and similarly U.cl.5 in urban. R.cl.1 to R.cl.5 is the increasing order of the income classes in rural and similarly U.cl.1 to U.cl.5 in urban.

4.3) FOR THE OTHER SECTIONS

Explanation is the same as provided in section 3 of this paper.

5) LISTING OF US RESULTS

Table 2. Output Variables Used in US Output Tables

Category	Description
1. Domsup	Domestic Supply includes production and beginning stocks
2. Agtrd	Net imports
3. Qloss	Quantity of product loss
4. Qseed	Quantity of seed use
5. Qfeed	Quantity of feed use
6. Demind	Demand for industrial consumption
7. Demgov	Demand for Government consumption
8. Cons	Consumption for direct human consumption
9. Endstk	Ending year stocks
10. Domdem	Domestic demand including stock demand

Table 3. Commodity Definitions used in US Output Tables

Commodity	Included Commodities and Units
1. Wheat (th. MT grain equiv.)	Wheat (th. MT grain equiv.)
2. Rice (th. MTM)	Rice (th. MTM)
3. Coarse grains (th. MT)	Corn, Grain sorghum, oats, barley, rye (th. MT)
4. Potatoes (th. MT)	Irish potatoes (th. MT)
5. Vegetables (th. MT)	Fresh and processed vegetables (th. MT)
6. Dry beans (th. MT)	Dry beans and peas (th. MT)
7. Fruit	Citrus and noncitrus fruits, melons and nuts (th. MT fresh equiv.)
8. Tobacco	Tobacco (th. MT leaf equiv.)
9. Fats/oil	Fats and oils (th. MT oil equiv.)
10. Sugar	Sugar cane and beets (th. MT refined equiv.)
11. Coffee	Coffee (th. MT bean equiv.)
12. Beef	Beef and veal (th. MT carcass weight)
13. Lamb	Lamb and mutton (th. MT carcass weight)
14. Pork	Pork (th. MT carcass weight)
15. Poultry	Chicken and Turkey (th. MT ready-to-cook-basis)
16. Eggs	(th. MT)
17. Milk	Fresh milk, cheese, butter and other dairy products (th. MT protein equiv.)
18. Fish	Fish (th. MT protein equiv.)
19. Protein feeds	Soybeans, peanuts, sunflowers and flaxseed (th. MT protein equiv.)
20. Nonagriculture	Durables, services, other nonagriculture (mi. $ 1969-71)

Table 4. Aggregate Output Tables for US Model

Variable	Definition
Prices	
World	World prices
Target Consumer	Same as equilibrium price in most cases
Equilibrium consumer	model solution prices
Stocks	
Maximum	Upper limit
Target	Same as equilibrium stocks in most cases
Equilibrium	Model solution stocks
Minimum	Lower limit
Net imports	
Maximum	Upper limit
Equilibrium	Model solution net imports
Minimum	Lower limit
Government consumption	Government consumption
Type	Type of solution (not currently used)

Table 5. Aggregate Output Tables for US Model

	US Category	IIASA Category
1.	Wheat	Wheat
2.	Rice	Rice milled
3.	Coarse grains	Coarse grains
4.	Beef/lamb	Bovine and ovine meat
5.	Diary	Dairy products
6.	Other meat	Other animals
7.	Protein foods	Protein feeds
8.	Other foods	Other food production
9.	Ind. crops	Nonfood agricultural products
10.	Nonag.	Nonagricultural production

Appendix C

SAMPLE OUTPUTS

This appendix reproduces samples of (1) unit 4 detailed output for a country, (2) unit 1 OTHERP output for a country, and (3) unit 6 FAMUSP output for the U.S. intermediate model.

Unit 4 detailed output for Japan.

JAPAN YEAR : 1980

	CURRENT	CONSTANT(1970)	: GROWTH
GDP	122926416.	110483124.	4.05
GDPA	4707529.0	5791167.0	0.47
GDPNA	118218896.	104691904.	4.25
TRADE DEFICIT	-1252614.0	-1125816.0	
TAXES	421206.0		
TARIFF RECEIPTS	831393.6		
PHI (CORR.)	0.99657		
PHI (ORIG.)	0.94382		
DEFLATOR AGRICULTURE	0.8129		
DEFLATOR NONAGR.	1.1292		
DEFLATOR GDP	1.1126		
DEFLATOR CROP PROD.	0.9136	PIFOOD	0.9532
EXCHANGE RATE	359.97095		
GDP/CAP (US $ 1970)	2605.6		
CAL/CAP/DAY	3308.4		
GR.PROTEIN/CAP/DAY	116.8		

SUPPLY AND DEMAND :

NR	TY	SUPPLY	HUM.CONS	FEED	INT.CONS	GOV.DEM	STOCK	DEMAND	NET TRADE	DOM.PRICE	CONS/CAP	SSR
1	0	58.30	4104.54	2165.42	342.61	0.0	0.0	6612.57	-6554.27	71.1545	34.85	0.0088
2	0	10261.58	8914.71	1734.12	127.93	0.0	0.0	10776.77	-515.18	144.5301	75.68	0.9522
3	0	27.43	1290.60	12823.08	149.38	0.0	0.0	14263.26	-14235.82	40.4590	10.96	0.0019
4	0	388.56	803.03	0.0	0.0	0.0	0.0	803.03	-414.46	538.8115	6.82	0.4839
5	0	4902.87	6441.32	397.94	0.0	0.0	0.0	6839.26	-1936.39	94.1418	54.68	0.7169
6	0	1361.20	1494.23	58.71	3.55	0.0	0.0	1556.50	-195.30	2570.0635	12.69	0.8745
7	0	621.91	1117.11	1056.43	0.0	0.0	0.0	2173.54	-1551.63	143.4040	9.48	0.2861
8	0	9018.34	9577.14	282.85	247.42	0.0	0.0	10106.61	-1088.27	670.8743	81.31	0.8923
9	0	527.69	1742.74	0.0	0.0	0.0	0.0	1742.74	-1215.05	821.6182	14.80	0.3028
10	0	292379.44	279948.69	0.0	4358.53	0.0	0.0	284308.25	8071.19	406.3679	2376.65	1.0284

PRICE RELATIONS :

		INCL.PROCESSING (NATIONAL CURRENCY)			RAW MATERIAL (NATIONAL CURR.)		RAW MATERIAL (FOREIGN CURR.)	
NR	TY	DES.PR.	DOM.PR.	WM.PR.	DOM.PR.	WM.PR.	DOM.PR.	WM.PR.
1	0	71.1545	71.1545	51.1131	44.6797	24.6383	0.1241	0.0684
2	0	144.5301	144.5301	79.7973	123.9264	59.1936	0.3443	0.1644
3	0	40.4590	40.4590	25.5144	35.3416	20.3970	0.0982	0.0567
4	0	538.8115	538.8115	583.8013	221.9934	266.9829	0.6167	0.7417
5	0	94.1418	94.1418	102.9086	35.8358	44.6024	0.0996	0.1239
6	0	2570.0635	2570.0635	3269.5549	1456.9648	2176.4558	4.0475	6.0462
7	0	143.4040	143.4040	69.2715	111.1799	57.0473	0.3089	0.1585
8	0	670.8743	670.8743	792.3076	351.0613	382.4949	0.9752	1.0626
9	0	821.6182	821.6182	344.0342	821.6182	344.0342	2.2825	0.9557
10	0	406.3679	406.3679	406.3682	406.3679	406.3682	1.1289	1.1289

RESULTS OF ALLOCATION MODEL :
==========

CAP = 70537.75 TLA = 6399.445 TFNET = 682.4287
SCA = 53.97168 SLA = 244.5378 STF = 1372.643

SHADOW PRICES :

.0	39.681	.0	.0	.0	1487.4	2969.7	780.61

IMPLIED PRICES :

51.871	183.55	41.030	257.50	350.13	1909.0	4920.4	1851.8

NR	PRICE	OUTPUT	CAPITAL	LABOR	FERTILIZER	CAP/UNIT	LAB/UNIT	FERT/UNIT
1	51.87165	57.40375	16.44527	.4132224	.3643847	286.4841	7.198526	6.347751
2	143.6729	10362.78	14101.42	636.0159	368.2827	1360.776	61.37502	35.53897
3	41.03001	27.03366	7.152531	.1923839	.8852726D-01	264.5786	7.116457	3.274704
4	257.5010	123.6500	204.5950	4.724951	2.711720	1654.630	38.21230	21.93060
5	350.1304	8841.180	28741.26	2964.969	300.4678	3250.840	335.3589	33.98503
6	421.5532	302.3916	428.7048	1026.657	10.51351	1417.714	3395.125	34.76784
7	1950.717	235.1024	6456.113	940.3374		27460.86	3999.694	
8	1071.188	1417.941	20582.05	826.1338		14515.45	582.6289	

****

SECTORAL DATA ON ENDOWMENTS,RESOURCES
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	WHEAT	RICE	C.GRAIN	BOVINE	MILK	O.ANIM.	P.FEED	O.FOOD	O.AGR.	NON-AGR.	LABOR	CAPITAL
SECTOR 1	57.4	10362.8	27.0	398.2	5044.9	1417.9	605.9	8888.9	535.3	0.0	6399.	25391552.
SECTOR 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	304502.3	54765.	366820864.
PRATIO	2.44417	2.82176	2.33535	1.12169	1.08290	0.90226	1.94891	0.91782	2.38819	1.00000		

****

PLANNED SUPPLY FOR YEAR : 1981
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TRADE DEFICIT = -.211089E+07
POPULATION = 119230.
TOTAL LABOR FORCE = 61165.
CAPITAL STOCK = 392212224.
GROSS INVESTMENT = 38690544.
AGRIC. INVESTMENT = 1836044.
NAGR. INVESTMENT = 36854496.
FERTILIZER PRICE = 87.003
NITROG.FERTILIZER = 723.93
CAPACITY INDEX = 1.0000

Unit 1 OTHERP output for Japan.

MODEL RESULTS FOR JAPAN (113)

GENERAL INDICATORS :

YEAR	GDP71	GDPA71	GDPNA76	TR.DEF71	PA/PNA	PNA	AG.CAP.	NAG.CAP.	FERT.	EXCH.RTE
1970	71615560.	4774683.	66841934.	-942994.	1.01604	1.00000	14229000.	175491008.	0.0	359.971
1971	74478944.	5263958.	69218481.	-2078218.	0.92720	1.02097	15177031.	192007344.	827.576	359.971
1972	78118681.	5343674.	72774416.	-2202195.	0.91100	0.98507	16040847.	206188528.	806.046	359.971
1973	81916388.	5434684.	76475712.	-2158849.	0.87431	0.98601	16954832.	221333616.	817.768	359.971
1974	85766800.	5497469.	80269280.	-1926961.	0.85504	1.10458	17904784.	237181104.	804.582	359.971
1975	89672632.	5526376.	84145664.	-2106232.	0.83551	1.01247	18888320.	253740960.	780.407	359.971
1976	93724768.	5625556.	88099264.	-1991258.	0.80498	1.07263	19893424.	270852352.	784.879	359.971
1977	97807072.	5675345.	92131696.	-1879899.	0.78313	1.13718	20935632.	288687360.	756.444	359.971
1978	101930400.	5696536.	96233856.	-1815466.	0.76953	1.13462	22005632.	307164160.	744.114	359.971
1979	106186480.	5764040.	100422464.	-1355238.	0.73343	1.13792	23102656.	326329344.	731.935	359.971
1980	110483024.	5791167.	104691904.	-1125816.	0.71987	1.12921	24234080.	346240000.	722.933	359.971

GENERAL INDICATORS :

YEAR	POP.	TLA.	TLNA.	CAL/CAP	PROT/CAP
1970	104331.	10491.	42899.	3186.3	108.024
1971	105605.	10073.	44105.	3223.6	109.417
1972	106894.	9663.	45173.	3231.6	110.188
1973	108199.	9265.	46241.	3240.4	110.852
1974	109520.	8875.	47309.	3244.0	113.639
1975	110857.	8493.	48376.	3256.5	112.109
1976	112211.	8121.	49443.	3266.9	112.987
1977	113581.	7758.	50509.	3273.7	114.726
1978	114967.	7414.	51575.	3284.8	114.560
1979	116371.	7080.	52638.	3300.3	115.676
1980	117792.	6724.	53703.	3308.4	116.780

WHEAT :
=======

YEAR	PROD.PR.	SUPPLY	NET.EXP	RET.PR.	DEMAND	HUM.CONS	INT.CONS	FEED	SSR
1970	60.2200	415.461	-4869.5	83.6752	5284.9	3438.3	237.510	1609.1	0.07861
1971	60.22[illegible]	6[illegible].96	-5258.9	78.671[illegible]	5319.3	3547.9	226.604	1544.4	[illegible]
1972	60.22[illegible]	57.136	-5391.3	71.9543	5448.4	3608.3	238.227	1601.8	0.01049
1973	60.22[illegible]	57.395	-5535.2	72.2976	5552.6	3670.0	250.332	1672.3	0.01076
1974	60.22[illegible]	57.893	-5703.9	66.6009	5761.8	3734.3	262.739	1764.9	0.01005
1975	60.2200	45.947	-5966.7	72.7457	6012.6	3791.7	275.441	1945.5	0.00764
1976	60.2200	58.653	-5914.4	74.6825	5973.0	3852.8	288.339	1831.8	0.00982
1977	60.2200	59.642	-6037.5	72.4531	6098.5	3914.9	301.530	1882.1	0.00968
1978	60.2200	53.263	-6319.0	76.9221	6372.3	3976.0	314.958	2081.4	0.00836
1979	60.2200	59.360	-6369.3	73.8058	6428.7	4043.1	328.642	2056.0	0.00924
1980	60.2200	58.301	-6554.3	71.1545	6612.6	4104.5	342.613	2165.4	0.00882

RICE MILLED :
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YEAR	PROD.PR.	SUPPLY	NET.EXP	RET.PR.	DEMAND	HUM.CONS	INT.CONS	FEED	SSR
1970	167.030	10253.	450.664	185.278	9802.	8594.1	76.350	1131.9	1.04597
1971	167.030	9426.	-706.472	170.432	10132.	8791.9	84.612	1255.7	0.93028
1972	167.030	9743.	-453.133	154.419	10196.	8897.4	88.952	1299.9	0.95556
1973	167.030	9804.	-456.291	154.390	10261.	8816.7	93.472	1350.5	0.95553
1974	167.030	9867.	-498.449	133.053	10365.	8869.8	98.104	1397.1	0.95191
1975	167.030	9967.	-531.855	154.399	10499.	8856.2	102.847	1539.6	0.94934
1976	167.030	10195.	-345.645	156.959	10441.	8840.0	107.663	1493.3	0.96690
1977	167.030	10040.	-507.984	147.755	10548.	8886.7	112.589	1548.6	0.95184
1978	167.030	10143.	-500.742	166.272	10643.	8876.9	117.602	1649.0	0.95295
1979	167.030	10235.	-436.341	151.476	10672.	8891.8	122.712	1657.1	0.95906
1980	167.030	10262.	-515.184	144.530	10777.	8914.7	127.928	1734.1	0.95219

COARSE GRAINS :
==========

YEAR	PROD.PR.	SUPPLY	NET.EXP	RET.PR.	DEMAND	HUM.CONS	INT.CONS	FEED	SSR
1970	47.6341	106.053	-11146.	52.1572	11252.	1020.1	122.080	10110.	0.00942
1971	47.6341	27.175	-10195.	47.9184	10222.	1106.2	98.860	9017.	0.00266
1972	47.6341	26.023	-10627.	43.3894	10653.	1125.3	103.868	9424.	0.00244
1973	47.6341	26.162	-11077.	43.3671	11103.	1145.1	109.146	9849.	0.00236
1974	47.6341	26.527	-11669.	37.2027	11696.	1165.9	114.555	10415.	0.00227
1975	47.6341	21.107	-12834.	43.3518	12855.	1184.6	120.093	11551.	0.00164
1976	47.6341	27.109	-12091.	44.0414	12108.	1204.8	125.717	10778.	0.00224
1977	47.6341	27.480	-12402.	41.3732	12430.	1225.3	131.468	11073.	0.00221
1978	47.6341	24.849	-13691.	44.9447	13716.	1245.8	137.323	12333.	0.00181
1979	47.6341	27.883	-13542.	42.4341	13570.	1270.4	143.289	12156.	0.00205
1980	47.6341	27.430	-14236.	40.4590	14263.	1290.8	149.381	12823.	0.00192

BOVINE AND OVINE MEAT :
==========

YEAR	PROD.PR.	SUPPLY	NET.EXP	RET.PR.	DEMAND	HUM.CONS	INT.CONS	FEED	SSR
1970	299.206	437.873	-184.361	579.853	622.231	622.231	0.0	0.0	0.70371
1971	299.206	342.341	-296.316	558.433	638.651	638.651	0.0	0.0	0.53604
1972	299.206	325.113	-329.899	515.832	655.012	655.012	0.0	0.0	0.49635
1973	299.206	330.574	-341.780	521.013	672.354	672.354	0.0	0.0	0.49167
1974	299.206	337.474	-353.433	512.140	690.907	690.907	0.0	0.0	0.48845
1975	299.206	345.729	-361.201	527.884	706.930	706.930	0.0	0.0	0.48906
1976	299.206	353.617	-371.653	547.070	725.270	725.270	0.0	0.0	0.48757
1977	299.206	360.762	-382.556	546.597	743.318	743.318	0.0	0.0	0.48534
1978	299.206	369.483	-392.921	568.364	762.403	762.403	0.0	0.0	0.48463
1979	299.206	378.995	-404.989	553.415	783.984	783.984	0.0	0.0	0.48342
1980	299.206	388.565	-414.465	538.812	803.030	803.030	0.0	0.0	0.48387

DAIRY PRODUCTS :
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YEAR	PROD.PR.	SUPPLY	NET.EXP	RET.PR.	DEMAND	HUM.CONS	INT.CONS	FEED	SSR
1970	48.3000	4710.1	-659.7	89.9577	5369.7	4950.3	0.0	419.446	0.87714
1971	48.3000	3836.1	-1350.1	96.6241	5186.2	4898.3	0.0	287.865	0.73967
1972	48.3000	3728.2	-1631.8	89.4003	5360.0	5062.9	0.0	297.106	0.69555
1973	48.3000	3875.9	-1669.3	91.3613	5545.2	5236.6	0.0	308.621	0.69897
1974	48.3000	4328.9	-1713.9	89.6799	5742.7	5423.3	0.0	319.410	0.70155
1975	48.3000	4168.2	-1737.6	91.5898	5925.8	5574.8	0.0	350.973	0.70677
1976	48.3000	4334.3	-1754.2	95.1166	6189.1	5747.8	0.0	341.253	0.71191
1977	48.3000	4465.2	-1807.5	95.4491	6272.8	5919.0	0.0	353.756	0.71184
1978	48.3000	4659.0	-1855.8	98.9470	6464.8	6188.0	0.0	376.756	0.71294
1979	48.3000	4757.6	-1896.0	96.5546	6653.6	6273.4	0.0	380.146	0.71505
1980	48.3000	4922.9	-1936.4	94.1418	6839.3	6441.3	0.0	397.940	0.71687

OTHER ANIMALS :
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YEAR	PROD.PR.	SUPPLY	NET.EXP	RET.PR.	DEMAND	HUM.CONS	INT.CONS	FEED	SSR
1970	1963.7	1089.4	36.529	2949.7	1302.9	1217.4	3.97000	41.5543	1.02496
1971	1963.7	968.3	-145.152	2791.3	1113.5	1069.6	2.35059	41.5259	0.86964
1972	1963.7	1114.3	-143.529	2559.9	1157.9	1111.9	2.47116	43.4949	0.87604
1973	1963.7	1054.9	-142.982	2575.7	1197.8	1150.0	2.59672	45.2298	0.88063
1974	1963.7	1091.2	-241.675	2452.4	1333.0	1284.1	2.72541	46.2560	0.81855
1975	1963.7	1214.4	-65.967	2596.2	1280.3	1225.4	2.85718	52.0721	0.94848
1976	1963.7	1166.4	-163.368	2672.6	1329.7	1276.7	2.99097	50.0136	0.87714
1977	1963.7	1211.4	-211.512	2614.2	1423.3	1368.2	3.12789	51.9432	0.85111
1978	1963.7	1296.5	-127.426	2759.3	1424.0	1365.1	3.26709	55.6658	0.91052
1979	1963.7	1297.2	-196.566	2658.4	1494.2	1434.9	3.40903	55.9258	0.86818
1980	1963.7	1361.2	-195.299	2570.1	1556.5	1494.2	3.55396	58.7131	0.87453

PROTEIN FEEDS :
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YEAR	PROD.PR.	SUPPLY	NET.EXP	RET.PR.	DEMAND	HUM.CONS	INT.CONS	FEED	SSR
1970	111.180	660.450	-1420.5	139.740	2081.9	997.8	32.1700	1051.0	0.31738
1971	111.180	388.284	-1444.1	139.307	1832.4	1002.0	0.0	830.4	0.21190
1972	111.180	462.923	-1384.3	135.130	1847.2	1013.7	0.0	833.5	0.25060
1973	111.180	476.371	-1399.3	191.024	1869.7	1025.5	0.0	844.2	0.25157
1974	111.180	519.634	-1287.1	119.951	1801.9	1037.8	0.0	764.1	0.28571
1975	111.180	499.720	-1532.2	114.438	2031.9	1049.7	0.0	982.2	0.24594
1976	111.180	554.698	-1513.6	102.795	2168.5	1062.0	0.0	1106.5	0.26827
1977	111.180	531.892	-1681.5	155.244	2183.4	1074.5	0.0	1108.9	0.22987
1978	111.180	610.797	-1458.2	142.149	2165.0	1093.2	0.0	975.9	0.29521
1979	111.180	556.621	-1581.3	145.234	2131.9	1098.0	0.0	1034.9	0.25827
1980	111.180	621.911	-1551.6	143.434	2173.5	1117.1	0.0	1056.4	0.28613

OTHER FOOD PRODUCTION :
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YEAR	PROD.PR.	SUPPLY	NET.EXP	RET.PR.	DEMAND	HUM.CONS	INT.CONS	FEED	SSR
1970	351.062	7697.7	-1183.1	634.377	8161.	7755.5	225.360	199.971	0.86761
1971	351.062	9394.1	1129.2	644.156	8265.	7883.3	163.642	218.004	1.13662
1972	351.062	9346.1	906.5	602.542	8442.	8050.4	172.036	219.153	1.10738
1973	351.062	9439.7	790.9	608.716	8649.	8241.8	180.777	226.168	1.09145
1974	351.062	9456.8	877.2	746.411	8562.	8132.0	189.736	239.844	1.10246
1975	351.062	9621.7	-2.1	620.525	9023.	8610.9	198.909	217.025	0.99977
1976	351.062	9411.1	124.9	642.024	9285.	8832.2	208.224	244.764	1.01345
1977	351.062	9418.7	80.1	710.154	9339.	8869.7	217.759	251.137	1.00858
1978	351.062	9073.7	-619.5	673.831	9653.	9211.3	227.446	254.434	0.93609
1979	351.062	9237.0	-697.4	671.402	9934.	9423.0	237.328	274.059	0.92980
1980	351.062	9018.3	-1088.3	670.874	10107.	9577.1	247.418	282.040	0.89232

NON-FOOD AGRICULTURAL PRODUCTS :

YEAR	PROD.PR.	SUPPLY	NET.EXP	RET.PR.	DEMAND	HUM.CONS	INT.CONS	FEED	SSR
1970	821.619	527.660	-990.9	821.633	1518.6	1518.6	0.0	0.0	0.34748
1971	821.619	440.681	-1072.4	769.120	1513.0	1513.0	0.0	0.0	0.29125
1972	821.619	447.423	-1089.2	832.028	1536.7	1536.7	0.0	0.0	0.29117
1973	821.619	465.118	-1096.0	865.285	1561.1	1561.1	0.0	0.0	0.29794
1974	821.619	476.830	-1109.5	907.553	1586.3	1586.3	0.0	0.0	0.30060
1975	821.619	488.339	-1123.1	660.561	1611.4	1611.4	0.0	0.0	0.30304
1976	821.619	493.252	-1142.7	842.192	1636.0	1636.0	0.0	0.0	0.30151
1977	821.619	501.149	-1159.4	871.412	1660.6	1660.6	0.0	0.0	0.30179
1978	821.619	510.282	-1176.1	821.879	1686.4	1686.4	0.0	0.0	0.30260
1979	821.619	516.992	-1206.8	816.229	1723.8	1723.8	0.0	0.0	0.29992
1980	821.619	527.683	-1215.1	821.618	1742.7	1742.7	0.0	0.0	0.30279

NONAGRICULTURAL PRODUCTION :

YEAR	PRICE	SUPPLY	NET.EXP	INVESTM.	DEMAND	CONSUMP.	INT.CONS	SSR
1970	359.971	186205.	5910.6	0.	180294.	176421.	3873.7	1.03278
1971	367.494	193380.	8407.9	72536.	184972.	108390.	4046.1	1.04545
1972	347.361	203299.	9108.8	66045.	194190.	122046.	4098.3	1.04691
1973	354.886	213628.	9386.6	72781.	204242.	127297.	4163.9	1.04596
1974	397.493	224215.	6985.1	76881.	215230.	134149.	4200.4	1.04175
1975	364.404	235056.	9547.5	81396.	225568.	140209.	4203.0	1.04234
1976	386.035	246063.	9044.8	84927.	237018.	147812.	4279.6	1.03816
1977	409.276	257320.	8921.7	89353.	248398.	154744.	4301.5	1.03592
1978	408.333	268779.	8478.7	93623.	260300.	162373.	4394.5	1.03257
1979	409.506	280457.	8249.4	96106.	272207.	169751.	4349.8	1.03030
1980	406.368	292379.	8271.2	102861.	284308.	177089.	4358.5	1.02839

Unit 6 FAMUSP output for the U.S. intermediate model.

	1 BFCOWT			2 DCOWT			3 DHEIFT			4 SOWFBT		
1970.0	.367E+05	.367E+05	0.	.121E+05	.121E+05	0.	.388E+04	.388E+04	0.	.711E+04	.711E+04	0.
1971.0	.379E+05	.378E+05	-0.	.119E+05	.118E+05	-1.	.384E+04	.381E+04	-1.	.724E+04	.696E+04	-4.
1972.0	.388E+05	.389E+05	0.	.118E+05	.115E+05	-2.	.383E+04	.379E+04	-1.	.650E+04	.668E+04	3.
1973.0	.409E+05	.399E+05	-3.	.116E+05	.113E+05	-3.	.387E+04	.380E+04	-2.	.644E+04	.651E+04	1.
1974.0	.432E+05	.418E+05	-3.	.113E+05	.112E+05	-1.	.394E+04	.394E+04	0.	.632E+04	.635E+04	0.
1975.0	.457E+05	.433E+05	-5.	.112E+05	.111E+05	-1.	.409E+04	.416E+04	2.	.497E+04	.585E+04	18.

	5 SOWFFT			6 PORKQT			7 FREFQT			8 MILKQT		
1970.0	.688E+04	.688E+04	0.	.218E+05	.218E+05	0.	.182E+05	.182E+05	0.	.117E+06	.117E+06	0.
1971.0	.634E+04	.595E+04	-6.	.228E+05	.225E+05	-2.	.183E+05	.189E+05	4.	.119E+06	.117E+06	-1.
1972.0	.597E+04	.630E+04	5.	.209E+05	.209E+05	-0.	.189E+05	.195E+05	4.	.120E+06	.118E+06	-2.
1973.0	.587E+04	.543E+04	-7.	.202E+05	.209E+05	4.	.175E+05	.178E+05	1.	.115E+06	.113E+06	-2.
1974.0	.548E+04	.602E+04	10.	.200E+05	.193E+05	-3.	.189E+05	.184E+05	-3.	.116E+06	.117E+06	2.
1975.0	.495E+04	.523E+04	6.	.168E+05	.191E+05	14.	.177E+05	.184E+05	4.	.115E+06	.115E+06	-0.

	9 NFBFQT			10 TURKQT			11 CHIKQT			12 EGGQT		
1970.0	.345E+04	.345E+04	0.	.173E+04	.173E+04	0.	.847E+04	.847E+04	0.	.570E+04	.570E+04	0.
1971.0	.362E+04	.361E+04	-0.	.177E+04	.184E+04	4.	.852E+04	.865E+04	2.	.581E+04	.568E+04	-2.
1972.0	.352E+04	.378E+04	8.	.191E+04	.199E+04	4.	.889E+04	.910E+04	2.	.574E+04	.568E+04	-1.
1973.0	.371E+04	.380E+04	2.	.193E+04	.216E+04	12.	.870E+04	.902E+04	3.	.550E+04	.556E+04	1.
1974.0	.426E+04	.475E+04	12.	.192E+04	.203E+04	6.	.892E+04	.957E+04	7.	.547E+04	.553E+04	1.
1975.0	.623E+04	.613E+04	-2.	.180E+04	.240E+04	33.	.882E+04	.965E+04	9.	.539E+04	.549E+04	2.

	13 APCT			14 APWT			15 APSRT			16 APUT		
1970.0	.669E+05	.669E+05	0.	.487E+05	.487E+05	0.	.431E+05	.431E+05	0.	.244E+05	.244E+05	0.
1971.0	.742E+05	.760E+05	2.	.538E+05	.574E+05	7.	.435E+05	.429E+05	-1.	.218E+05	.223E+05	2.
1972.0	.671E+05	.690E+05	3.	.542E+05	.578E+05	7.	.469E+05	.485E+05	3.	.200E+05	.207E+05	3.
1973.0	.723E+05	.723E+05	0.	.593E+05	.551E+05	-7.	.565E+05	.537E+05	-5.	.186E+05	.194E+05	4.
1974.0	.779E+05	.808E+05	4.	.710E+05	.701E+05	-1.	.525E+05	.495E+05	-6.	.170E+05	.186E+05	9.
1975.0	.786E+05	.778E+05	-1.	.748E+05	.757E+05	1.	.546E+05	.565E+05	3.	.165E+05	.186E+05	13.

	17 APBT			18 APSWT			19 QBSGR			20 ADBN		
1970.0	.105E+05	.105E+05	0.	.170E+05	.170E+05	0.	.264E+05	.264E+05	0.	.150E+04	.150E+04	0.
1971.0	.111E+05	.119E+05	7.	.205E+05	.202E+05	-2.	.271E+05	.257E+05	-5.	.136E+04	.153E+04	13.
1972.0	.106E+05	.987E+04	-7.	.170E+05	.171E+05	0.	.284E+05	.288E+05	1.	.149E+04	.149E+04	0.
1973.0	.110E+05	.117E+05	6.	.190E+05	.186E+05	-2.	.245E+05	.257E+05	5.	.140E+04	.144E+04	3.
1974.0	.871E+04	.878E+04	1.	.176E+05	.176E+05	-0.	.221E+05	.199E+05	-10.	.162E+04	.161E+04	-1.
1975.0	.929E+04	.966E+04	4.	.181E+05	.199E+05	10.	.297E+05	.299E+05	1.	.152E+04	.137E+04	-9.

	21 APUTO			22 ARICE			23 QGNUT			24 AVEG		
1970.0	.145E+04	.145E+04	0.	.183E+04	.183E+04	0.	.298E+07	.298E+07	0.	.320E+04	.320E+04	0.
1971.0	.143E+04	.146E+04	2.	.183E+04	.187E+04	2.	.301E+07	.275E+07	-9.	.315E+04	.371E+04	18.
1972.0	.130E+04	.140E+04	8.	.182E+04	.190E+04	4.	.327E+07	.298E+07	-9.	.322E+04	.320E+04	-1.
1973.0	.133E+04	.141E+04	6.	.218E+04	.205E+04	-6.	.347E+07	.321E+07	-7.	.335E+04	.321E+04	-4.
1974.0	.142E+04	.145E+04	4.	.256E+04	.277E+04	8.	.367E+07	.345E+07	-6.	.332E+04	.330E+04	-0.
1975.0	.130E+04	.151E+04	16.	.282E+04	.285E+04	1.	.340E+07	.391E+07	1.	.340E+04	.366E+04	8.

	25 ATOB			26 UCSGR			27 WHTYT			28 SOYHYT		
1970.0	898.	898.	0.	.288E+04	.288E+04	0.	31.0	31.0	0.	26.7	26.7	0.
1971.0	834.	856.	2.	.276E+04	.228E+04	-17.	33.9	33.9	0.	27.5	27.5	0.
1972.0	842.	862.	2.	.304E+04	.230E+04	-24.	32.7	32.7	0.	27.8	27.8	0.
1973.0	887.	868.	-2.	.280E+04	.232E+04	-17.	31.6	31.6	0.	27.8	27.8	0.
1974.0	963.	905.	-6.	.280E+04	.234E+04	-16.	27.3	27.3	0.	23.7	23.7	0.
1975.0	.109E+04	.107E+04	-1.	.323E+04	.502E+04	55.	30.6	30.6	0.	28.9	28.9	0.

	29 SORHYT			30 BARYT			31 OATYT			32 CORNYT		
1970.0	50.4	50.4	0.	42.8	42.8	0.	49.2	49.2	0.	72.4	72.4	0.
1971.0	53.8	53.8	0.	45.8	45.8	0.	55.9	55.9	0.	88.1	88.1	0.
1972.0	60.7	60.7	0.	43.7	43.7	0.	51.5	51.5	0.	97.0	97.0	0.
1973.0	58.8	58.8	0.	40.5	40.5	0.	47.9	47.9	0.	91.3	91.3	0.
1974.0	45.1	45.1	0.	37.7	37.7	0.	47.6	47.6	0.	71.9	71.9	0.
1975.0	49.0	49.0	0.	43.9	43.9	0.	49.0	49.0	0.	86.3	86.3	0.

	33 CSILYT			34 SSILYT			35 APCTT			36 RICEW		
1970.0	11.0	11.0	0.	10.1	10.1	0.	.119E+05	.119E+05	0.	.838E+05	.838E+05	0.
1971.0	11.5	12.5	9.	12.7	11.2	-12.	.124E+05	.120E+05	-3.	.858E+05	.841E+05	-2.
1972.0	12.7	13.4	6.	13.9	11.6	-16.	.140E+05	.126E+05	-10.	.854E+05	.862E+05	1.
1973.0	12.4	12.8	3.	11.9	11.4	-5.	.125E+05	.133E+05	6.	.928E+05	.939E+05	1.
1974.0	11.6	8.95	-23.	9.85	10.2	4.	.137E+05	.119E+05	-13.	.112E+06	.127E+06	13.
1975.0	11.5	11.7	1.	9.77	9.86	1.	.949E+04	.103E+05	8.	.128E+06	.132E+06	3.

	37 DBNQ			38 COTQT			39 COTCRUSH			40 POTOW		
1970.0	.174E+05	.174E+05	0.	.102E+05	.102E+05	0.	.383E+04	.383E+04	0.	.326E+06	.326E+06	0.
1971.0	.159E+05	.186E+05	17.	.105E+05	.109E+05	4.	.401E+04	.438E+04	9.	.319E+06	.330E+06	3.
1972.0	.181E+05	.181E+05	0.	.137E+05	.133E+05	-3.	.515E+04	.526E+04	2.	.296E+06	.322E+06	9.
1973.0	.164E+05	.175E+05	7.	.130E+05	.144E+05	11.	.472E+04	.562E+04	19.	.299E+06	.329E+06	10.
1974.0	.203E+05	.196E+05	-4.	.115E+05	.109E+05	-5.	.429E+04	.428E+04	-0.	.342E+06	.350E+06	2.
1975.0	.174E+05	.167E+05	-4.	.830E+04	.969E+04	17.	.286E+04	.379E+04	32.	.320E+06	.363E+06	14.

	41 TOBQ			42 COTSTKT			43 QFLAX			44 VEGQ		
1970.0	.191E+07	.191E+07	0.	.576E+04	.576E+04	0.	.295E+05	.295E+05	0.	.431E+04	.431E+04	0.
1971.0	.170E+07	.174E+07	2.	.425E+04	.425E+04	0.	.182E+05	.183E+05	1.	.527E+04	.817E+04	55.
1972.0	.175E+07	.176E+07	1.	.330E+04	.330E+04	0.	.139E+05	.179E+05	29.	.699E+04	.562E+04	-20.
1973.0	.174E+07	.178E+07	2.	.420E+04	.420E+04	0.	.161E+05	.175E+05	9.	.755E+04	.570E+04	-24.
1974.0	.199E+07	.186E+07	-6.	.380E+04	.380E+04	0.	.132E+05	.171E+05	28.	.656E+04	.570E+04	-13.
1975.0	.218E+07	.221E+07	1.	.570E+04	.570E+04	0.	.150E+05	.168E+05	12.	.944E+04	.801E+04	-15.

	45 UFRT			46 CRUSHT			47 SOILQT			48 HPCAUT		
1970.0	.217E+05	.217E+05	0.	760.	760.	0.	.827E+04	.827E+04	0.	91.4	91.5	0.
1971.0	.231E+05	.230E+05	-0.	721.	721.	0.	.789E+04	.789E+04	0.	91.2	91.2	0.
1972.0	.211E+05	.239E+05	13.	722.	722.	0.	.750E+04	.750E+04	0.	89.4	89.2	-0.
1973.0	.255E+05	.247E+05	-3.	821.	821.	0.	.900E+04	.900E+04	0.	90.2	89.9	-0.
1974.0	.252E+05	.256E+05	2.	701.	701.	0.	.738E+04	.738E+04	0.	86.4	85.9	-1.
1975.0	.270E+05	.271E+05	0.	865.	865.	0.	.963E+04	.963E+04	0.	91.0	90.5	-0.

	49 LSTKPXT			50 GCAUT			51 SMPFRHPC			52 FGGCAU		
1970.0	101.	96.0	-5.	80.0	78.7	-2.	147.	143.	-3.	1.73	1.72	-1.
1971.0	97.3	95.9	-1.	80.2	77.7	-3.	145.	147.	2.	1.86	1.82	-2.
1972.0	109.	105.	-3.	79.4	74.6	-6.	134.	127.	-5.	1.96	1.96	0.
1973.0	137.	134.	-2.	78.5	76.1	-3.	157.	174.	11.	1.94	1.89	-2.
1974.0	112.	130.	17.	69.8	70.9	2.	144.	174.	21.	1.66	1.85	12.
1975.0	107.	133.	25.	75.0	76.0	1.	172.	166.	-3.	1.70	1.88	11.

	53 FGCONT			54 SOYMQT			55 GPFR			56 RICPR		
1970.0	138.	135.	-2.	.135E+05	.130E+05	-3.	.107	.107	-1.	4.30	4.17	-3.
1971.0	149.	141.	-5.	.132E+05	.134E+05	2.	.117	.916E-01	-14.	4.12	4.10	-0.
1972.0	155.	146.	-6.	.120E+05	.113E+05	-5.	.124	.113	-9.	5.59	5.62	1.
1973.0	152.	144.	-5.	.141E+05	.157E+05	11.	.145	.155	7.	10.5	12.3	17.
1974.0	116.	131.	13.	.124E+05	.149E+05	20.	.127	.122	-4.	7.45	8.27	11.
1975.0	126.	143.	12.	.156E+05	.150E+05	-4.	.124	.124	0.	4.96	5.35	8.

	57 WSHLMB			58 PPUTO			59 PVEG			60 PDBN		
1970.0	.110E+07	.110E+07	0.	1.90	2.43	28.	68.8	87.2	27.	7.74	11.2	45.
1971.0	.106E+07	.974E+06	-8.	1.57	1.59	2.	72.5	68.1	-6.	9.07	8.75	-4.
1972.0	.100E+07	.930E+06	-7.	2.40	2.38	-1.	75.8	68.8	-9.	8.78	7.94	-10.
1973.0	.891E+06	.868E+06	-0.	3.67	3.03	-17.	80.4	72.9	-9.	20.3	17.6	-13.
1974.0	.805E+06	.848E+06	5.	2.71	2.63	-3.	79.9	87.4	9.	13.5	7.74	-43.
1975.0	.773E+06	.810E+06	5.	2.78	3.70	33.	77.5	108.	39.	12.4	12.9	4.

	61 PCSTKT			62 PWSTKT			63 PCOF			64 PSUG		
1970.0	.0	.0	0.	.0	.0	0.	.783	1.01	29.	76.2	109.	43.
1971.0	.0	.0	0.	.0	.0	0.	.770	.746	-3.	74.7	78.1	5.
1972.0	.0	.0	0.	.0	.0	0.	.740	.756	2.	82.1	88.0	7.
1973.0	.0	.0	0.	.0	.0	0.	.781	.876	12.	137.	166.	22.
1974.0	.0	.0	0.	.0	.0	0.	.829	1.13	36.	219.	178.	-19.
1975.0	.0	.0	0.	.0	.0	0.	1.11	1.15	3.	104.	81.1	-22.

	65 SBSTKT			66 PLMB			67 WHTFDT			68 QWL		
1970.0	78.0	114.	46.	20.4	19.6	-4.	193.	206.	7.	.162E+06	.162E+06	0.
1971.0	67.6	120.	78.	19.2	19.1	-0.	202.	141.	-46.	.160E+06	.158E+06	-1.
1972.0	179.	151.	-15.	21.0	21.6	0.	201.	114.	-43.	.159E+06	.149E+06	-6.
1973.0	200.	187.	-9.	24.7	26.7	8.	128.	59.0	-54.	.145E+06	.141E+06	-3.
1974.0	260.	132.	-49.	24.9	25.7	12.	39.1	35.0	-10.	.133E+06	.133E+06	0.
1975.0	118.	212.	80.	24.0	27.0	12.	34.0	88.3	160.	.120E+06	.126E+06	5.

	69 PPLTRY			70 PFRT			71 PPTOB			72 SOILPT		
1970.0	13.0	13.6	5.	78.2	108.	37.	62.8	62.8	0.	11.1	11.1	-0.
1971.0	12.6	12.8	2.	79.1	75.2	-5.	65.1	65.1	0.	9.40	9.40	-0.
1972.0	12.4	13.9	12.	96.6	85.9	-11.	66.2	66.2	0.	13.2	13.2	-0.
1973.0	20.0	20.8	4.	101.	97.4	-4.	67.6	67.6	0.	23.7	23.7	-0.
1974.0	15.3	18.7	22.	89.4	116.	29.	73.8	73.8	0.	20.8	20.8	-0.
1975.0	17.2	21.2	23.	76.9	107.	40.	63.9	63.9	0.	11.4	11.4	-0.

	73 CORNPT			74 SOYMPT			75 WHTPT			76 PORKPT		
1970.0	1.14	1.11	-3.	3.38	3.28	-3.	1.14	1.11	-3.	18.9	18.1	-4.
1971.0	.890	.892	0.	3.72	3.72	0.	1.10	1.11	0.	15.2	16.0	5.
1972.0	1.25	1.25	0.	9.14	9.15	0.	1.40	1.41	0.	21.3	21.0	-1.
1973.0	1.92	1.88	-2.	5.50	4.02	-27.	2.97	3.03	2.	30.3	30.2	-0.
1974.0	2.04	1.97	-4.	4.43	4.93	11.	2.77	2.50	-10.	23.8	26.5	11.
1975.0	1.58	1.51	-4.	4.58	6.03	31.	2.21	2.10	-5.	30.0	30.5	2.

	77 FBEFPT			78 BFCOWP			79 MILKPT			80 CHIKPT		
1970.0	25.2	24.6	-3.	18.0	17.8	-1.	4.91	4.76	-3.	11.7	12.4	6.
1971.0	26.7	25.9	-3.	17.5	20.8	19.	4.84	4.84	-0.	11.4	11.5	1.
1972.0	29.6	28.1	-2.	19.8	21.2	7.	4.84	4.85	0.	11.3	12.5	11.
1973.0	33.5	33.4	-0.	24.7	27.6	12.	5.36	6.03	12.	18.0	19.2	6.
1974.0	28.4	32.2	13.	17.2	19.4	13.	5.64	6.70	19.	14.6	17.0	17.
1975.0	27.7	32.0	16.	13.4	21.2	58.	5.43	6.24	15.	16.3	19.5	19.

	81 TURKPT			82 EGGPT			83 GFSH			84 PREEF		
1970.0	19.4	19.7	1.	33.6	30.1	-10.	.492E+04	.492E+04	0.	24.1	23.5	-2.
1971.0	18.2	19.1	5.	25.9	26.4	2.	.502E+04	.502E+04	0.	25.2	25.1	-0.
1972.0	17.7	20.4	15.	24.7	28.2	15.	.481E+04	.481E+04	0.	27.2	27.0	-1.
1973.0	28.7	27.8	-3.	39.4	40.6	3.	.486E+04	.486E+04	0.	31.9	32.4	1.
1974.0	19.0	26.7	41.	36.0	40.6	13.	.497E+04	.497E+04	0.	26.3	29.5	12.
1975.0	21.6	28.1	30.	32.5	42.5	31.	.484E+04	.484E+04	0.	24.0	29.3	22.

	85 FGSTKT			86 PWCSGR			87 SOYAPT			88 MLKSTK		
1970.0	34.7	22.6	-35.	6.96	6.96	0.	2.45	2.36	-4.	.560E+04	.555E+04	-1.
1971.0	50.1	48.2	-4.	7.01	7.01	0.	2.50	2.46	-1.	.464E+04	.561E+04	21.
1972.0	33.8	20.4	-40.	7.26	7.26	0.	3.49	3.40	-2.	.389E+04	.491E+04	26.
1973.0	23.7	20.2	-15.	7.74	7.74	0.	4.27	3.50	-18.	.358E+04	.553E+04	54.
1974.0	16.9	17.3	3.	19.8	19.8	0.	4.50	4.68	4.	.413E+04	.485E+04	17.
1975.0	19.0	20.1	6.	14.0	14.0	0.	3.05	3.69	21.	.777E+04	.528E+04	-32.

	89 GNUTST			90 DPCIT			91 COTPT			92 WHTQT		
1970.0	.345E+06	.345E+06	0.	.290E+04	.292E+04	1.	18.9	18.9	-0.	.135E+07	.135E+07	0.
1971.0	.462E+06	.462E+06	0.	.297E+04	.297E+04	0.	23.3	23.3	0.	.162E+07	.173E+07	7.
1972.0	.449E+06	.449E+06	0.	.307E+04	.315E+04	2.	21.8	21.8	-0.	.155E+07	.169E+07	9.
1973.0	.418E+06	.418E+06	0.	.323E+04	.320E+04	-1.	33.5	28.1	-16.	.171E+07	.155E+07	-9.
1974.0	.831E+06	.831E+06	0.	.314E+04	.315E+04	0.	29.0	23.2	-20.	.178E+07	.171E+07	-4.
1975.0	.120E+07	.120E+07	0.	.315E+04	.337E+04	7.	31.8	26.7	-16.	.212E+07	.206E+07	-3.

	93 SOYBQT			94 SORHQT			95 BARQT			96 OATQT		
1970.0	.113E+07	.113E+07	0.	.683E+06	.683E+06	0.	.416E+06	.416E+06	0.	.915E+06	.915E+06	0.
1971.0	.118E+07	.116E+07	-2.	.668E+06	.827E+06	-5.	.462E+06	.496E+06	7.	.876E+06	.913E+06	4.
1972.0	.127E+07	.132E+07	4.	.801E+06	.787E+06	-2.	.422E+06	.393E+06	-7.	.691E+06	.779E+06	13.
1973.0	.155E+07	.146E+07	-6.	.923E+06	.829E+06	-10.	.417E+06	.432E+06	4.	.659E+06	.679E+06	3.
1974.0	.122E+07	.115E+07	-6.	.623E+06	.602E+06	-3.	.299E+06	.302E+06	1.	.601E+06	.646E+06	8.
1975.0	.155E+07	.160E+07	3.	.753E+06	.742E+06	-1.	.374E+06	.387E+06	3.	.642E+06	.665E+06	4.

	97 CORNQT			98 CSILQT			99 SSILQT			100 WHTSIK		
1970.0	.415E+07	.415E+07	0.	.941E+05	.941E+05	0.	.720E+04	.720E+04	0.	823.	813.	-1.
1971.0	.565E+07	.571E+07	1.	.109E+06	.122E+06	11.	.110E+05	.953E+04	-13.	983.	.107E+04	9.
1972.0	.558E+07	.570E+07	2.	.109E+06	.119E+06	9.	.995E+04	.834E+04	-16.	597.	640.	7.
1973.0	.567E+07	.563E+07	-1.	.114E+06	.118E+06	3.	.952E+04	.885E+04	-7.	340.	388.	14.
1974.0	.470E+07	.495E+07	5.	.116E+06	.925E+05	-20.	.728E+04	.754E+04	4.	435.	427.	-2.
1975.0	.583E+07	.572E+07	-2.	.116E+06	.116E+06	0.	.743E+04	.825E+04	11.	665.	516.	-22.

	101 PM			102 PN			103 LFM			104 LFN		
1970.0	132.	132.	0.	71.1	71.1	0.	54.2	54.2	0.	27.6	27.6	0.
1971.0	133.	134.	1.	71.5	71.5	0.	55.3	55.3	-0.	28.0	28.0	0.
1972.0	135.	136.	0.	71.9	72.0	0.	56.3	56.3	0.	28.5	28.5	-0.
1973.0	136.	137.	1.	72.1	72.5	1.	57.4	57.4	-0.	28.9	28.9	0.
1974.0	137.	139.	2.	72.3	73.0	1.	58.4	58.5	0.	29.4	29.4	-0.
1975.0	139.	141.	1.	72.5	73.6	1.	59.5	59.5	0.	29.8	29.8	0.

	105 EMPM			106 EMPN			107 MT			108 GRINCM		
1970.0	51.6	51.8	0.	26.3	26.3	0.	.340	.340	0.	595.	595.	0.
1971.0	52.8	52.8	0.	26.7	26.7	0.	.325	.341	5.	616.	616.	-0.
1972.0	53.8	53.8	0.	27.2	27.2	-0.	.310	.315	2.	638.	638.	-0.
1973.0	54.9	54.9	-0.	27.6	27.6	0.	.296	.296	0.	662.	661.	-0.
1974.0	55.9	55.9	0.	28.1	28.1	-0.	.282	.279	-1.	685.	684.	-0.
1975.0	57.0	57.0	-0.	28.5	28.5	0.	.269	.263	-2.	709.	708.	-0.

	109 GRINCN			110 PINCM			111 PINCN			112 KSM		
1970.0	243.	243.	0.	573.	573.	0.	265.	265.	0.	.279E+04	.279E+04	0.
1971.0	253.	253.	0.	594.	594.	-0.	275.	276.	0.	.294E+04	.294E+04	0.
1972.0	263.	263.	0.	615.	615.	-0.	286.	286.	0.	.310E+04	.309E+04	-0.
1973.0	272.	272.	0.	637.	637.	-0.	297.	297.	0.	.326E+04	.325E+04	-0.
1974.0	282.	282.	0.	659.	659.	-0.	307.	308.	0.	.342E+04	.342E+04	0.
1975.0	292.	292.	0.	682.	681.	-0.	318.	319.	0.	.359E+04	.359E+04	-0.

	113 KSG			114 KM			115 KN			116 EXM		
1970.0	.120E+04	.120E+04	0.	.256E+04	.256E+04	0.	.110E+04	.110E+04	0.	59.3	59.3	0.
1971.0	.126E+04	.127E+04	0.	.271E+04	.271E+04	0.	.117E+04	.117E+04	0.	61.4	61.5	0.
1972.0	.133E+04	.134E+04	0.	.286E+04	.286E+04	-0.	.124E+04	.124E+04	-0.	63.6	63.7	0.
1973.0	.141E+04	.141E+04	-0.	.301E+04	.301E+04	0.	.130E+04	.131E+04	1.	65.8	65.9	0.
1974.0	.148E+04	.149E+04	0.	.317E+04	.317E+04	-0.	.138E+04	.138E+04	-0.	68.1	68.2	0.
1975.0	.156E+04	.157E+04	0.	.333E+04	.333E+04	0.	.145E+04	.146E+04	0.	70.4	70.5	0.

	117 EXN			118 CONM			119 CONN			120 INVM		
1970.0	37.9	37.9	0.	376.	376.	0.	154.	154.	0.	219.	219.	0.
1971.0	39.1	39.0	-0.	389.	389.	-0.	160.	160.	0.	227.	227.	-0.
1972.0	40.2	40.1	-0.	404.	404.	-0.	166.	166.	0.	235.	235.	0.
1973.0	41.3	41.3	-0.	418.	418.	-0.	172.	172.	-0.	243.	243.	-0.
1974.0	42.5	42.5	-0.	433.	433.	-0.	178.	178.	0.	252.	252.	-0.
1975.0	43.7	43.7	-0.	448.	448.	0.	184.	185.	0.	261.	261.	-0.

	121 INVN			122 GNP			123 POPT			124 BALPMT		
1970.0	89.4	89.8	0.	858.	853.	-1.	205.	205.	0.	-.468E+04	-.509E+04	-9.
1971.0	93.4	93.1	-0.	864.	873.	-1.	207.	205.	-1.	170.	-630.	-463.
1972.0	96.6	96.6	0.	935.	934.	-0.	209.	208.	-1.	.489E+04	.387E+04	-21.
1973.0	99.8	100.	0.	986.	.100E+04	2.	210.	210.	-0.	.204E+04	-662.	-132.
1974.0	104.	104.	0.	972.	981.	1.	212.	212.	0.	.334E+04	.351E+04	5.
1975.0	108.	107.	-0.	969.	.102E+04	6.	214.	215.	0.	-.547E+04	-557.	90.

	125 TAXR			126 AMNTIM			127 RCNTIM			128 CGNTIM		
1970.0	.144	.134	-7.	-.189E+05	-.186E+05	1.	-.163E+04	-.159E+04	2.	-.151E+05	-.291E+05	-92.
1971.0	.142	.138	-3.	-.150E+05	-.187E+05	-24.	-.158E+04	-.161E+04	-2.	-.178E+05	-.174E+05	2.
1972.0	.154	.137	-11.	-.296E+05	-.368E+05	-24.	-.163E+04	-.163E+04	-0.	-.340E+05	-.553E+05	-63.
1973.0	.149	.171	15.	-.320E+05	-.297E+05	7.	-.181E+04	-.183E+04	-1.	-.351E+05	-.298E+05	15.
1974.0	.154	.159	3.	-.265E+05	-.257E+05	3.	-.228E+04	-.273E+04	-20.	-.309E+05	-.187E+05	40.
1975.0	.135	.122	-9.	-.312E+05	-.318E+05	-2.	-.269E+04	-.282E+04	-5.	-.438E+05	-.254E+05	42.

	129 PCNTIM			130 VCNTIM			131 DRNTIM			132 FRNTIM		
1970.0	-.159E+04	-.202E+04	-27.	.512E+04	.451E+04	-12.	-166.	-117.	30.	-.210E+04	-.312E+04	-48.
1971.0	-.112E+04	-.173E+04	-54.	.437E+04	.261E+04	-40.	-99.0	-170.	-71.	-.316E+04	-.307E+04	3.
1972.0	-153.	-.111E+04	-629.	.314E+04	.472E+04	51.	-149.	-158.	-13.	-.204E+04	-.341E+04	-67.
1973.0	-380.	-.124E+04	-227.	.344E+04	.413E+04	20.	-53.0	-126.	-137.	-.512E+04	-.427E+04	17.
1974.0	-.231E+04	-.221E+04	4.	.447E+04	.312E+04	-30.	-194.	-197.	-1.	-.453E+04	-.569E+04	-26.
1975.0	-609.	-.245E+04	-303.	.139E+04	.151E+04	9.	-114.	-89.9	21.	-.551E+04	-.657E+04	-19.

	133 TONTIM			134 FONTIM			135 SUNTIM			136 CONTIM		
1970.0	86.8	138.	59.	-.109E+04	-.158E+04	-44.	.417E+04	.330E+04	-21.	.127E+04	.128E+04	0.
1971.0	167.	176.	5.	-.127E+04	-976.	23.	.434E+04	.415E+04	-4.	.124E+04	.131E+04	5.
1972.0	166.	156.	-7.	-764.	-.193E+04	-146.	.408E+04	.395E+04	-3.	.131E+04	.127E+04	-3.
1973.0	167.	145.	-13.	-.239E+04	-.187E+04	21.	.460E+04	.427E+04	-8.	.131E+04	.126E+04	-4.
1974.0	56.1	113.	102.	-447.	-571.	-28.	.452E+04	.478E+04	6.	.125E+04	.125E+04	-0.
1975.0	-44.7	-29.8	33.	-.276E+04	-.157E+04	43.	.278E+04	.159E+04	-43.	.120E+04	.121E+04	1.

	137 BFNTIM			138 LMNTIM			139 PKNTIM			140 PLNTIM		
1970.0	843.	445.	-47.	67.4	82.4	22.	468.	-519.	-211.	152.	-137.	-190.
1971.0	835.	-76.7	-109.	69.6	101.	44.	894.	-502.	-156.	189.	-133.	-170.
1972.0	.101E+04	93.1	-91.	100.	88.7	-11.	935.	-78.3	-108.	216.	-111.	-151.
1973.0	979.	.100E+04	2.	65.3	93.5	43.	632.	-543.	-186.	-352.	-110.	69.
1974.0	923.	157.	-83.	49.9	112.	124.	.120E+04	-72.2	-106.	175.	-293.	-267.
1975.0	.101E+04	48.3	-95.	32.8	92.8	183.	935.	63.1	-93.	197.	-146.	-174.

	141 EGNTIM			142 MKNTIM			143 FSNTIM			144 PFNTIM		
1970.0	-4.13	-20.5	-397.	849.	.150E+04	76.	.164E+04	.238E+04	45.	-.126E+05	-.122E+05	3.
1971.0	5.65	-14.3	-353.	541.	.162E+04	200.	.182E+04	.310E+04	70.	-.134E+05	-.124E+05	7.
1972.0	5.46	-155.	-2938.	697.	.148E+04	112.	.255E+04	.264E+04	3.	-.141E+05	-.174E+05	-23.
1973.0	18.5	-192.	-1136.	.270E+04	.285E+04	6.	967.	.105E+04	16.	-.196E+05	-.164E+05	16.
1974.0	-7.53	-88.5	-1175.	.238E+04	-587.	-125.	813.	653.	5.	-.135E+05	-.120E+05	11.
1975.0	-37.5	-215.	-475.	.450E+04	.256E+04	-43.	.110E+04	854.	-22.	-.215E+05	-.183E+05	15.

	145 AONTIM			146 CPWHT			147 CPRTC			148 CPCG		
1970.0	-.429E+04	-.320E+04	25.	.860E-01	.834E-01	-3.	.231	.224	-3.	.396	.384	-3.
1971.0	-294.	120.	141.	.875E-01	.877E-01	0.	.239	.238	-1.	.321	.322	0.
1972.0	.393E+04	.699E+04	78.	.870E-01	.871E-01	0.	.240	.241	1.	.467	.468	0.
1973.0	.558E+04	.229E+04	-59.	.110	.113	2.	.308	.361	17.	.759	.746	-2.
1974.0	.511E+04	.678E+04	33.	.150	.135	-10.	.510	.573	11.	.899	.866	-4.
1975.0	747.	.493E+04	560.	.145	.138	-5.	.470	.507	8.	.756	.722	-4.

	149 CPPOT			150 CPVEG			151 CPDB			152 CPFRT		
1970.0	.890E-01	.114	28.	.120	.152	27.	.192	.279	45.	.969E-01	.133	37.
1971.0	.861E-01	.875E-01	2.	.125	.117	-6.	.222	.214	-4.	.108	.102	-5.
1972.0	.920E-01	.917E-01	-1.	.135	.122	-9.	.248	.224	-10.	.120	.107	-11.
1973.0	.137	.113	-17.	.166	.151	-9.	.318	.276	-13.	.137	.132	-4.
1974.0	.166	.161	-3.	.197	.216	9.	.691	.395	-43.	.146	.189	29.
1975.0	.134	.179	33.	.172	.239	39.	.421	.437	4.	.149	.209	40.

	153 CPTOB			154 CPFD			155 CPSUG			156 CPCOF		
1970.0	5.84	5.66	-3.	.246	.375	53.	.130	.185	43.	.911	1.18	29.
1971.0	6.18	6.19	0.	.277	.288	4.	.136	.142	5.	.934	.905	-3.
1972.0	6.42	6.43	0.	.275	.302	10.	.139	.149	7.	.927	.947	2.
1973.0	6.74	6.63	-2.	.308	.372	20.	.151	.184	22.	1.04	1.17	12.
1974.0	7.26	7.08	-3.	.435	.531	22.	.323	.262	-19.	1.22	1.67	36.
1975.0	8.03	8.01	-0.	.558	.589	6.	.372	.291	-22.	1.79	1.85	3.

	157 CPBF			158 CPLMB			159 CPPRK			160 CPPLT		
1970.0	.986	.962	-2.	1.06	1.02	-4.	.780	.749	-4.	.406	.425	5.
1971.0	1.04	1.04	-0.	1.10	1.10	-0.	.703	.738	5.	.410	.418	2.
1972.0	1.14	1.13	-1.	1.19	1.19	0.	.832	.820	-1.	.414	.465	12.
1973.0	1.35	1.38	1.	1.34	1.45	8.	1.10	1.10	-0.	.596	.622	4.
1974.0	1.39	1.56	12.	1.46	1.64	12.	1.08	1.20	11.	.560	.683	22.
1975.0	1.46	1.79	22.	1.68	1.88	12.	1.35	1.38	2.	.633	.780	23.

	161 CPEGG			162 CPMLK			163 CPFSM			164 CPPF		
1970.0	.390	.349	-10.	.119	.116	-3.	.775	.770	-1.	.393E-01	.381E-01	-3.
1971.0	.337	.344	2.	.126	.126	-0.	.886	.759	-14.	.451E-01	.452E-01	0.
1972.0	.334	.382	15.	.131	.131	0.	.927	.843	-9.	.114	.115	0.
1973.0	.498	.512	3.	.146	.164	12.	1.05	1.13	7.	.731E-01	.535E-01	-27.
1974.0	.499	.562	13.	.181	.215	19.	1.29	1.24	-4.	.654E-01	.728E-01	11.
1975.0	.490	.642	31.	.183	.211	15.	1.41	1.41	0.	.739E-01	.972E-01	31.

	165 CPAOGS			166 PCCWHT			167 PCCRIC			168 PCCCG		
1970.0	1.17	1.13	-3.	150.	151.	1.	6.56	6.94	6.	87.3	84.4	-3.
1971.0	1.22	1.22	0.	149.	149.	-0.	7.55	6.84	-9.	87.9	87.9	0.
1972.0	1.25	1.25	0.	149.	149.	0.	6.96	7.09	2.	91.7	96.8	6.
1973.0	1.27	1.25	-2.	150.	150.	0.	6.90	7.10	3.	98.4	105.	7.
1974.0	1.36	1.31	-3.	147.	151.	3.	7.52	6.97	-7.	104.	111.	6.
1975.0	1.50	1.43	-4.	150.	152.	1.	7.56	7.37	-2.	111.	123.	10.

	169 PCCPOT			170 PCCVEG			171 PCCDB			172 PCCFRT		
1970.0	116.	113.	-4.	89.8	84.3	-6.	5.90	6.43	9.	163.	152.	-7.
1971.0	119.	118.	-1.	89.8	95.7	7.	5.90	6.43	9.	161.	163.	1.
1972.0	119.	120.	1.	90.0	96.2	7.	6.40	6.25	-2.	156.	165.	6.
1973.0	117.	121.	3.	97.0	89.6	-8.	6.50	6.25	-4.	158.	161.	2.
1974.0	114.	118.	3.	99.1	78.1	-21.	6.70	6.33	-6.	161.	152.	-6.
1975.0	122.	120.	-2.	89.4	79.0	-12.	6.20	6.13	-1.	165.	154.	-7.

	173 PCCTOB			174 PCCFO			175 PCCSUG			176 PCCCOF		
1970.0	9.68	10.2	6.	50.9	48.9	-4.	102.	92.5	-9.	13.7	13.7	0.
1971.0	9.52	9.85	3.	50.5	50.5	0.	102.	95.3	-7.	13.2	14.0	6.
1972.0	9.65	9.62	-0.	52.6	53.5	2.	103.	95.8	-7.	13.8	13.5	-2.
1973.0	9.53	9.49	-0.	52.7	54.1	3.	102.	94.8	-7.	13.7	13.2	-4.
1974.0	9.41	9.42	0.	51.8	52.6	2.	96.6	92.6	-4.	13.0	13.0	-0.
1975.0	9.14	9.38	3.	51.8	56.0	8.	90.2	93.2	3.	12.4	12.4	0.

	177 PCCRF			178 PCCLMR			179 PCCPRK			180 PCCPLT		
1970.0	112.	108.	-4.	3.22	3.38	5.	65.5	54.9	-16.	48.9	45.8	-6.
1971.0	112.	106.	-5.	3.12	3.28	5.	72.2	56.8	-21.	49.2	47.1	-4.
1972.0	115.	110.	-4.	3.28	3.02	-8.	66.8	56.4	-16.	51.4	49.6	-3.
1973.0	109.	111.	2.	2.65	2.95	11.	61.0	50.9	-17.	44.6	49.8	11.
1974.0	116.	107.	-7.	2.28	3.02	32.	66.0	51.0	-23.	50.4	48.9	-3.
1975.0	119.	111.	-7.	2.92	2.71	34.	54.3	51.2	-6.	49.3	51.9	5.

	181 PCCEGG			182 PCCMLK			183 PCCFSH			184 PCCPF		
1970.0	40.7	40.5	-0.	561.	569.	1.	14.8	15.1	2.	.0	.0	0.
1971.0	41.1	40.3	-2.	559.	562.	1.	14.5	15.6	7.	.0	.0	0.
1972.0	40.3	38.4	-5.	561.	561.	0.	15.5	16.2	4.	.0	.0	0.
1973.0	38.5	36.8	-4.	555.	543.	-2.	15.9	15.5	-2.	.0	.0	0.
1974.0	37.7	37.2	-1.	540.	526.	-3.	15.2	15.4	1.	.0	.0	0.
1975.0	36.5	35.2	-4.	546.	538.	-1.	15.2	16.1	6.	.0	.0	0.

	185 PCCAO		
1970.0	.250E+04	.259E+04	4.
1971.0	.257E+04	.258E+04	1.
1972.0	.267E+04	.275E+04	3.
1973.0	.289E+04	.290E+04	0.
1974.0	.289E+04	.298E+04	3.
1975.0	.289E+04	.321E+04	11.

WHEAT SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGIMD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	63489.1	-18697.3	1470.5	1591.6	5608.5	0.0	0.0	14056.4	22114.7	48841.0
1971.	69274.9	-18673.5	1686.4	1873.0	3845.3	0.0	0.0	13833.6	29182.6	50601.4
1972.	75632.0	-36756.0	1834.8	1888.0	3093.8	0.0	0.0	14039.7	17418.5	38275.4
1973.	59663.1	-29722.3	1889.8	1799.9	1604.5	0.0	0.0	14285.4	10561.2	29940.7
1974.	57013.3	-25733.1	1656.1	2293.9	952.0	0.0	0.0	14566.2	11013.0	31280.2
1975.	67777.1	-31829.2	2246.0	2471.2	2400.9	0.0	0.0	14788.2	14041.0	35947.9

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

RICE SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGIMD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	2540.9	-1293.0	229.2	78.8	0.0	0.0	0.0	645.5	0.0	953.3
1971.	2555.2	-1007.9	230.0	80.0	0.0	0.0	0.0	630.7	0.0	947.3
1972.	2619.1	-1033.3	235.7	82.0	0.0	0.0	0.0	666.0	0.0	985.7
1973.	2854.2	-1033.	250.9	88.7	0.0	0.0	0.0	675.0	0.0	1021.2
1974.	3867.5	-2728.8	340.1	119.3	0.0	0.0	0.0	671.2	0.0	1130.0
1975.	4018.7	-2810.0	361.7	123.2	0.0	0.0	0.0	717.2	0.0	1202.1

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

COARSE GRAIN SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGIMD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	190696.3	-29377.6	3710.3	1757.1	122751.0	25.4	0.0	7848.0	20526.9	161018.5
1971.	210573.3	-17385.2	11402.8	1796.3	128645.2	25.4	0.0	8168.7	43729.8	193188.1
1972.	228393.1	-55252.1	11679.8	1607.8	132842.4	25.4	0.0	9119.3	18460.3	173140.4
1973.	201726.7	-29638.9	10995.6	1651.4	130906.5	25.4	0.0	9988.9	18326.0	171887.8
1974.	175276.7	-18695.6	9417.0	1562.1	119232.4	25.4	0.0	10649.2	15095.1	156581.1
1975.	197696.4	-25435.7	10932.1	1583.7	129763.5	25.4	0.0	11936.0	18220.1	172460.7

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

POTATOES SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGIMD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	14770.1	-2721.3	1634.3	1183.9	0.0	0.0	0.0	10530.0	0.0	12754.0
1971.	14958.8	-1726.8	1647.1	1194.9	0.0	0.0	0.0	10988.0	0.0	13230.0
1972.	14593.9	-1112.7	1621.6	1186.0	0.0	0.0	0.0	11313.0	0.0	13481.2
1973.	14918.0	-1241.0	1644.3	1151.9	0.0	0.0	0.0	11480.1	0.0	13676.3
1974.	15865.7	-2210.4	1116.6	1205.0	0.0	0.0	0.0	11339.2	0.0	13654.4
1975.	16471.2	-2451.4	1153.0	1232.8	0.0	0.0	0.0	11036.0	0.0	14019.8

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

VEGETABLES SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	3913.1	4507.1	587.0	0.0	0.0	0.0	0.0	7833.2	0.0	8420.2
1971.	7415.7	2610.8	1112.3	0.0	0.0	0.0	0.0	8914.1	0.0	10026.5
1972.	5097.5	4723.1	764.6	0.0	0.0	0.0	0.0	9055.9	0.0	9820.5
1973.	5173.9	4128.9	776.0	0.0	0.0	0.0	0.0	8526.0	0.0	9301.9
1974.	5174.6	3117.3	776.2	0.0	0.0	0.0	0.0	7515.7	0.0	8291.9
1975.	7262.7	1511.5	1089.4	0.0	0.0	0.0	0.0	7684.8	0.0	8774.2

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

DRY BEANS SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	789.2	-116.7	39.5	35.5	0.0	0.0	0.0	597.7	0.0	672.6
1971.	844.5	-169.9	42.2	36.1	0.0	0.0	0.0	596.3	0.0	674.6
1972.	823.2	-157.9	41.2	35.2	0.0	0.0	0.0	589.0	0.0	665.3
1973.	794.8	-125.7	39.7	34.0	0.0	0.0	0.0	595.3	0.0	669.0
1974.	888.0	-196.7	44.4	38.0	0.0	0.0	0.0	608.9	0.0	691.3
1975.	756.7	-89.9	37.8	32.4	0.0	0.0	0.0	596.5	0.0	666.7

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

FRUIT SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
197 .	20287.9	-3122.1	3183.2	0.0	0.0	0.0	0.0	14122.6	0.0	17165.8
1971.	21463.4	-3672.3	3219.5	0.0	0.0	0.0	0.0	15171.5	0.0	18391.0
1972.	22321.9	-3497.3	3345.3	0.0	0.0	0.0	0.0	15549.4	0.0	18894.7
1973.	23080.5	-4257.7	3462.1	0.0	0.0	0.0	0.0	15350.7	0.0	18812.7
1974.	23684.7	-5694.4	3582.7	0.0	0.0	0.0	0.0	14607.6	0.0	18190.3
1975.	25356.6	-6565.3	3613.5	0.0	0.0	0.0	0.0	14987.3	0.0	18790.8

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

TOBACCO SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	864.8	138.1	51.9	0.0	0.0	0.0	0.0	951.0	0.0	1002.9
1971.	788.9	175.8	47.3	0.0	0.0	0.0	0.0	917.3	0.0	964.6
1972.	797.4	156.5	47.8	0.0	0.0	0.0	0.0	905.9	0.0	953.7
1973.	897.6	145.1	46.4	0.0	0.0	0.0	0.0	905.6	0.0	952.1
1974.	844.2	113.4	50.7	0.0	0.0	0.0	0.0	907.0	0.0	957.8
1975.	1003.2	-29.5	60.2	0.0	0.0	0.0	0.0	913.2	0.0	973.4

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

FATS/OILS SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	8741.0	-1570.0	0.0	224.1	0.0	2351.5	0.0	4543.0	44.4	7163.4
1971.	8979.7	-975.7	0.0	223.3	0.0	2419.2	0.0	4706.4	655.1	8004.0
1972.	9804.0	-1931.4	0.0	252.1	0.0	2435.6	0.0	5040.6	144.3	7872.0
1973.	10713.3	-1673.4	0.0	279.5	0.0	2427.9	0.0	5152.2	985.3	8634.9
1974.	9026.2	-571.9	0.0	257.5	0.0	2373.4	0.0	5063.0	761.4	8455.3
1975.	10902.7	-1568.8	0.0	293.6	0.0	2386.3	0.0	5452.6	1277.4	9333.9

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

SUGAR SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	5353.0	3297.3	53.5	0.0	0.0	0.0	0.0	8597.4	0.0	8650.9
1971.	4769.7	4152.7	47.7	0.0	0.0	0.0	0.0	8874.7	0.0	8922.4
1972.	5122.7	3953.7	51.2	0.0	0.0	0.0	0.0	9025.2	0.0	9076.4
1973.	4799.1	4274.7	48.0	0.0	0.0	0.0	0.0	9025.8	0.0	9073.8
1974.	4177.2	4776.5	41.8	0.0	0.0	0.0	0.0	8911.9	0.0	8953.7
1975.	7562.0	1586.3	75.6	0.0	0.0	0.0	0.0	9072.7	0.0	9148.3

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

COFFEE SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	0.0	1275.8	0.0	0.0	0.0	0.0	0.0	1275.8	0.0	1275.8
1971.	0.0	1306.5	0.0	0.0	0.0	0.0	0.0	1306.5	0.0	1306.5
1972.	0.0	1274.	0.0	0.0	0.0	0.0	0.0	1274.0	0.0	1274.0
1973.	0.0	1255.9	0.0	0.0	0.0	0.0	0.0	1255.9	0.0	1255.9
1974.	0.0	1249.4	0.0	0.0	0.0	0.0	0.0	1249.4	0.0	1249.4
1975.	0.0	1208.	0.0	0.0	0.0	0.0	0.0	1208.0	0.0	1208.0

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

BEEF SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	10097.0	444.5	504.9	0.0	0.0	0.0	0.0	10037.5	0.0	10542.4
1971.	10461.7	-76.7	523.1	0.0	0.0	0.0	0.0	9862.0	0.0	10385.1
1972.	10825.6	93.1	541.3	0.0	0.0	0.0	0.0	10376.8	0.0	10918.1
1973.	10020.5	1060.7	501.0	0.0	0.0	0.0	0.0	10520.2	0.0	11021.2
1974.	10715.4	157.2	535.8	0.0	0.0	0.0	0.0	10336.8	0.0	10872.6
1975.	11340.7	89.3	567.0	0.0	0.0	0.0	0.0	10822.0	0.0	11389.0

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

LAMB SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	283.0	82.4	16.2	0.0	0.0	0.0	0.0	313.4	0.0	326.1
1971.	216.2	101.6	10.8	0.0	0.0	0.0	0.0	305.4	0.0	316.7
1972.	206.3	88.7	10.3	0.0	0.0	0.0	0.0	284.6	0.0	295.0
1973.	196.9	93.5	9.8	0.0	0.0	0.0	0.0	280.5	0.0	290.3
1974.	188.0	111.6	9.4	0.0	0.0	0.0	0.0	290.2	0.0	299.6
1975.	179.6	92.8	9.0	0.0	0.0	0.0	0.0	263.4	0.0	272.4

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

PORK SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	5919.5	-519.2	296.0	0.0	0.0	0.0	0.0	5104.3	0.0	5400.3
1971.	6099.7	-571.6	305.0	0.0	0.0	0.0	0.0	5293.1	0.0	5598.1
1972.	5669.0	-78.3	283.5	0.0	0.0	0.0	0.0	5307.2	0.0	5590.7
1973.	5676.7	-543.0	283.8	0.0	0.0	0.0	0.0	4849.9	0.0	5133.7
1974.	5245.2	-72.2	262.3	0.0	0.0	0.0	0.0	4910.7	0.0	5173.0
1975.	5172.8	63.1	258.6	0.0	0.0	0.0	0.0	4977.2	0.0	5235.9

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

POULTRY SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	4624.0	-137.2	231.2	0.0	0.0	0.0	0.0	4255.6	0.0	4486.8
1971.	4757.2	-132.8	237.9	0.0	0.0	0.0	0.0	4386.0	0.0	4624.5
1972.	5032.9	-110.6	251.6	0.0	0.0	0.0	0.0	4670.7	0.0	4922.3
1973.	5071.5	-113.3	253.6	0.0	0.0	0.0	0.0	4707.6	0.0	4961.2
1974.	5261.2	-232.7	263.1	0.0	0.0	0.0	0.0	4705.4	0.0	4968.5
1975.	5466.7	-146.4	273.3	0.0	0.0	0.0	0.0	5046.9	0.0	5320.3

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

EGGS SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	4062.1	-26.5	0.0	276.2	0.0	0.0	0.0	3785.4	0.0	4041.6
1971.	4043.3	-14.3	0.0	274.9	0.0	0.0	0.0	3754.0	0.0	4029.0
1972.	4042.3	-154.8	0.0	274.9	0.0	0.0	0.0	3612.6	0.0	3887.5
1973.	3960.0	-191.6	0.0	269.3	0.0	0.0	0.0	3499.0	0.0	3768.2
1974.	3940.9	-88.5	0.0	268.0	0.0	0.0	0.0	3584.4	0.0	3852.4
1975.	3908.0	-215.5	0.0	265.8	0.0	0.0	0.0	3427.3	0.0	3693.1

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

MILK SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	56202.6	1477.0	1592.2	0.0	743.0	0.0	0.0	52846.7	2517.7	57694.6
1971.	55564.4	1623.1	1591.4	0.0	742.7	0.0	0.0	52309.8	2543.5	57187.4
1972.	55914.5	1474.4	1601.1	0.0	747.2	0.0	0.0	52816.8	2225.8	57392.9
1973.	53650.9	2849.6	1542.8	0.0	720.0	0.0	0.0	51728.6	2594.2	56500.5
1974.	55756.6	-587.1	1597.4	0.0	745.5	0.0	0.0	50625.0	2281.6	55169.5
1975.	54437.2	2563.0	1567.1	0.0	731.3	0.0	0.0	52307.6	2594.2	57000.2

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

FISH SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	2230.3	2377.0	111.5	0.0	0.0	3093.5	0.0	1403.0	0.0	4606.0
1971.	2276.2	3395.7	113.8	0.0	0.0	3098.2	0.0	1450.8	0.0	5372.0
1972.	2180.9	2080.1	109.0	0.0	0.0	319 .2	0.0	1520.9	0.0	4620.1
1973.	2203.6	1052.2	110.2	0.0	0.0	1065.7	0.0	1479.9	0.0	3255.6
1974.	2253.0	852.6	112.7	0.0	0.0	151 .0	0.0	1482.2	0.0	3105.7
1975.	2196.3	854.3	109.8	0.0	0.0	1372.0	0.0	1560.8	0.0	3050.6

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

PROTEIN FEED SUPPLY AND UTILIZATION

UNIT: THOUSAND METRIC TONS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	WSEED	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	27492.7	-12156.1	0.0	1000.6	11837.8	0.0	0.0	0.0	2496.1	15336.7
1971.	28296.6	-12433.1	0.0	997.6	12197.1	0.0	0.0	0.0	2658.8	15853.5
1972.	32696.1	-17377.6	0.0	1123.8	10279.1	0.0	0.0	0.0	3324.6	14716.5
1973.	35499.2	-16365.8	0.0	1243.8	14210.0	0.0	0.0	0.0	4079.6	19533.4
1974.	29668.9	-11984.4	0.0	1144.9	13557.4	0.0	0.0	0.0	2992.2	17684.5
1975.	37974.8	-19264.0	0.0	1296.6	13640.8	0.0	0.0	0.0	4773.4	19710.6

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

NONAGR SUPPLY AND UTILIZATION

UNIT: MILLION 1967 DOLLARS

YEAR	DOMSUP(1)	AGTRD(2)	WLOSS	MARGN	WFEED	DEMIND(3)	DEMGOV(4)	CONS	ENDSTK	DOMDEM
1970.	1624492.0	-3202.2	0.0	170305.0	0.0	738430.6	181224.4	531330.4	0.0	1621289.0
1971.	1609480.0	120.1	0.0	164145.6	0.0	732860.8	183029.2	529565.4	0.0	1609600.0
1972.	1731659.0	6988.2	0.0	191025.6	0.0	767497.8	189489.0	570644.6	0.0	1738647.0
1973.	1960607.0	2295.6	0.0	267790.1	0.0	889460.9	196380.5	609262.8	0.0	1962892.0
1974.	2029805.0	6782.8	0.0	281197.1	0.0	919843.4	203753.4	631795.3	0.0	2036587.0
1975.	2100256.0	4932.3	0.0	251704.1	0.0	952561.8	211627.3	689296.5	0.0	2105188.0

(1)PRODUCTION AND BEGINNING STOCKS (2)NET IMPORTS
(3)INDUSTRIAL CONSUMPTION (4)GOVERNMENT CONSUMPTION

WHEAT (IIASA AGGREGATE)
UNIT:TH MT GRAIN

YEAR	PRICES:MILLION $/UNIT WORLD	CONSUMER TARGET	CONSUMER EQUILIB	STOCKS MAXIMUM	STOCKS TARGET	STOCKS EQUILIB	STOCKS MINIMUM	NET IMPORTS MAXIMUM	NET IMPORTS EQUILIB	NET IMPORTS MINIMUM	GOVT CONS	TYPE
	PW	PD	P	XPUMAX	XPUTAR	XPU	XPUMIN	QIM	ZN	QEX	XPUI	
1970.	0.0620	0.1896	0.1896	26547.95	22114.69	22114.69	9098.68	-12228.7	-18623.7	-26669.4	0.0	2.
1971.	0.0654	0.1857	0.1857	34056.79	29162.80	29162.80	11672.16	-10507.0	-18673.1	-21931.5	0.0	2.
1972.	0.0585	0.1627	0.1627	33124.45	17418.46	17418.46	11352.62	-29743.4	-36753.2	[illegible]	0.0	2.
1973.	0.0731	0.1476	0.1476	30526.97	10561.16	10561.16	1.055.54	-21988.0	-29709.3	-32416.4	0.0	2.
1974.	0.0723	0.1478	0.1478	33545.44	11613.04	11613.04	11896.91	-20206.8	-25696.3	-29896.6	0.0	2.
1975.	0.0716	0.1350	0.1350	40558.91	14041.02	14041.02	13960.61	-28168.8	-31782.7	-38062.4	0.0	2.

RICE (IIASA AGGREGATE)
UNIT:TH MT MILLED

YEAR	PRICES:MILLION $/UNIT WORLD	CONSUMER TARGET	CONSUMER EQUILIB	STOCKS MAXIMUM	STOCKS TARGET	STOCKS EQUILIB	STOCKS MINIMUM	NET IMPORTS MAXIMUM	NET IMPORTS EQUILIB	NET IMPORTS MINIMUM	GOVT CONS	TYPE
	PW	PD	P	XPUMAX	XPUTAR	XPU	XPUMIN	QIM	ZN	QEX	XPUI	
1970.	0.2430	0.5093	0.5093	0.0	0.0	0.0	0.0	-1130.4	-1591.7	-2492.5	0.0	2.
1971.	0.2307	0.5035	0.5035	0.0	0.0	0.0	0.0	-1315.9	-1607.9	-2517.5	0.0	2.
1972.	0.2459	0.4509	0.4509	0.0	0.0	0.0	0.0	-1387.5	-1653.1	-2571.6	0.0	2.
1973.	0.2467	0.4735	0.4735	0.0	0.0	0.0	0.0	-1572.8	-1828.2	-2804.9	0.0	2.
1974.	0.2512	0.6282	0.6282	0.0	0.0	0.0	0.0	-2539.9	-2725.2	-3816.4	0.0	2.
1975.	0.2536	0.4975	0.4975	0.0	0.0	0.0	0.0	-2538.5	-2814.5	-3961.8	0.0	2.

CRS GRNS (IIASA AGGREGATE)
UNIT:TH MT GRAIN

YEAR	PRICES:MILLION $/UNIT WORLD	CONSUMER TARGET	CONSUMER EQUILIB	STOCKS MAXIMUM	STOCKS TARGET	STOCKS EQUILIB	STOCKS MINIMUM	NET IMPORTS MAXIMUM	NET IMPORTS EQUILIB	NET IMPORTS MINIMUM	GOVT CONS	TYPE
	PW	PD	P	XPUMAX	XPUTAR	XPU	XPUMIN	QIM	ZN	QEX	XPUI	
1970.	0.0573	0.8726	0.8726	37095.71	20526.87	20526.87	14371.98	22858.7	-26617.9	-73388.5	0.0	2.
1971.	0.0596	0.8616	0.8616	48502.59	43729.85	43729.85	18814.66	16575.4	-16[illegible]8.9	-53970.3	0.0	2.
1972.	0.0517	0.8738	0.8738	47107.01	18466.32	18466.32	16201.66	-15631.2	-54361.9	-90360.2	0.0	2.
1973.	0.0565	0.9788	0.9788	46828.53	18326.04	18326.04	16142.77	17676.1	-27678.4	-61227.2	0.0	2.
1974.	0.0572	0.9489	0.9489	40165.65	15695.07	15695.07	15538.12	40948.3	-19415.[illegible]	-54948.[illegible]	0.0	2.
1975.	0.0558	0.7093	1.7193	46557.93	18220.13	18220.13	18057.93	3475.3	-25143.2	-66967.6	0.0	2.

BEEF/LMB (IIASA AGGREGATE)
UNIT:TH MT CARCSS

YEAR	PRICES:MILLION $/UNIT WORLD	CONSUMER TARGET	CONSUMER EQUILIB	STOCKS MAXIMUM	STOCKS TARGET	STOCKS EQUILIB	STOCKS MINIMUM	NET IMPORTS MAXIMUM	NET IMPORTS EQUILIB	NET IMPORTS MINIMUM	GOVT CONS	TYPE
	PW	PD	P	XPUMAX	XPUTAR	XPU	XPUMIN	QIM	ZN	QEX	XPUI	
1970.	0.8767	2.2388	2.2388	0.0	0.0	0.0	0.0	1596.6	528.9	-9798.6	0.0	2.
1971.	0.9017	2.2498	2.2498	0.0	0.0	0.0	0.0	1277.4	32.1	-10138.5	0.0	2.
1972.	0.9395	2.1568	2.1568	0.0	0.0	0.0	0.0	743.6	189.5	-10896.2	0.0	2.
1973.	1.0004	1.8470	1.8470	0.0	0.0	0.0	0.0	2116.9	1118.4	-9656.8	0.0	2.
1974.	0.9749	1.7479	1.7479	0.0	0.0	0.0	0.0	1539.3	337.8	-10337.8	0.0	2.
1975.	0.9811	1.7945	1.7945	0.0	0.0	0.0	0.0	769.1	239.3	-10961.7	0.0	2.

DAIRY (IIASA AGGREGATE)
UNIT:TH MT MLK EQ

YEAR	PRICES:MILLION $/UNIT WORLD	CONSUMER TARGET	CONSUMER EQUILIB	STOCKS MAXIMUM	STOCKS TARGET	STOCKS EQUILIB	STOCKS MINIMUM	NET IMPORTS MAXIMUM	NET IMPORTS EQUILIB	NET IMPORTS MINIMUM	GOVT CONS	TYPE
	PW	PD	P	XPUMAX	XPUTAR	XPU	XPUMIN	QIM	ZN	QEX	XPUI	
1970.	0.1456	0.2634	0.2634	11891.75	2517.66	2517.66	2014.12	2182.8	1591.1	-10000.0	0.0	2.
1971.	0.1394	0.2666	0.2666	10847.93	2543.52	2543.52	2014.12	2817.7	1623.1	-8875.4	0.0	2.
1972.	0.1348	0.2443	0.2443	11569.41	2225.77	2225.77	1780.61	2491.2	1481.0	-9973.6	0.0	2.
1973.	0.1372	0.2153	0.2153	9941.00	2509.25	2509.25	1780.61	2990.0	2890.1	-7008.0	0.0	2.
1974.	0.1360	0.2353	0.2353	11935.38	2201.62	2201.62	1761.30	2494.8	-522.5	-10361.9	0.0	2.
1975.	0.1396	0.2069	0.2069	11459.71	2394.22	2394.22	1761.30	2941.8	2622.0	-9668.6	0.0	2.

OTH MEAT (IIASA AGGREGATE)
UNIT:TH MT PROTN

YEAR	PRICES:MILLION $/UNIT WORLD	CONSUMER TARGET	CONSUMER EQUILIB	STOCKS MAXIMUM	STOCKS TARGET	STOCKS EQUILIB	STOCKS MINIMUM	NET IMPORTS MAXIMUM	NET IMPORTS EQUILIB	NET IMPORTS MINIMUM	GOVT CONS	TYPE
	PW	PD	P	XPUMAX	XPUTAR	XPU	XPUMIN	QIM	ZN	QEX	XPUI	
1970.	5.9950	13.0761	13.0761	0.0	0.0	0.0	0.0	487.3	173.6	-1723.5	0.0	2.
1971.	5.9456	11.9966	11.9966	0.0	0.0	0.0	0.0	496.5	224.7	-1762.1	0.0	2.
1972.	6.0230	11.7581	11.7581	0.0	0.0	0.0	0.0	483.4	223.4	-1738.1	0.0	2.
1973.	5.9965	11.0635	11.0635	0.0	0.0	0.0	0.0	485.0	17.4	-1738.8	0.0	2.
1974.	5.9842	10.1463	10.1463	0.0	0.0	0.0	0.0	469.4	38.1	-1733.6	0.0	2.
1975.	6.0104	10.3736	10.3735	0.0	0.0	0.0	0.0	396.5	54.7	-1742.4	0.0	2.

PROT FDS (IIASA AGGREGATE)
UNIT:TH MT PROTN

YEAR	PRICES:MILLION $/UNIT WORLD PW	CONSUMER TARGET PD	CONSUMER EQUILIB P	STOCKS MAXIMUM XPUMAX	STOCKS TARGET XPUTAR	STOCKS EQUILIB XPU	STOCKS MINIMUM XPUMIN	NET IMPORTS MAXIMUM QIM	NET IMPORTS EQUILIB ZN	NET IMPORTS MINIMUM QEX	GOVT CONS XPU1	TYPE
1970.	0.2600	0.2078	0.2078	7236.77	1041.71	1041.71	27.87	-2663.6	-5059.0	-6912.2	0.0	2.
1971.	0.2576	0.2292	0.2292	7481.61	1108.71	1108.71	37.33	-3191.6	-5158.5	-7102.2	0.0	2.
1972.	0.2493	0.5133	0.5133	8458.95	1386.35	1386.35	36.23	-4298.7	-7228.4	-7905.9	0.0	2.
1973.	0.2533	0.1683	0.1683	10192.79	1701.19	1701.19	33.73	-6617.0	-6698.5	-9467.8	0.0	2.
1974.	0.2890	0.1914	0.1914	8056.34	1243.56	1243.56	67.11	-2236.1	-5018.1	-7571.4	0.0	2.
1975.	0.2869	0.2288	0.2288	10142.00	1990.49	1990.49	96.62	-5261.8	-7580.5	-8981.0	0.0	2.

OTH FOOD (IIASA AGGREGATE)
UNIT:MILL 1970 $

YEAR	PRICES:MILLION $/UNIT WORLD PW	CONSUMER TARGET PD	CONSUMER EQUILIB P	STOCKS MAXIMUM XPUMAX	STOCKS TARGET XPUTAR	STOCKS EQUILIB XPU	STOCKS MINIMUM XPUMIN	NET IMPORTS MAXIMUM QIM	NET IMPORTS EQUILIB ZN	NET IMPORTS MINIMUM QEX	GOVT CONS XPU1	TYPE
1970.	0.9470	1.9099	2.7118	650.17	151.64	11.21	11.21	1757.7	1757.7	-6060.6	0.0	1.
1971.	0.9575	1.9390	1.9390	746.13	163.30	163.30	15.00	1931.6	1571.1	-7013.4	0.0	2.
1972.	0.8988	1.7895	1.7895	898.99	203.33	36.32	14.69	1672.2	1672.2	-6795.7	0.0	4.
1973.	0.9010	1.5466	1.5466	1046.69	248.15	248.15	13.76	1636.9	1441.6	-7024.8	0.0	2.
1974.	0.9100	1.8485	1.8085	654.36	192.16	192.16	27.30	1389.6	1385.7	-6794.6	0.0	2.
1975.	0.9119	1.8300	1.8300	1127.07	310.07	310.07	40.00	1657.7	409.5	-8263.6	0.0	2.

IND CRPS (IIASA AGGREGATE)
UNIT:MILL 1970 $

YEAR	PRICES:MILLION $/UNIT WORLD PW	CONSUMER TARGET PD	CONSUMER EQUILIB P	STOCKS MAXIMUM XPUMAX	STOCKS TARGET XPUTAR	STOCKS EQUILIB XPU	STOCKS MINIMUM XPUMIN	NET IMPORTS MAXIMUM QIM	NET IMPORTS EQUILIB ZN	NET IMPORTS MINIMUM QEX	GOVT CONS XPU1	TYPE
1970.	0.9920	7.2981	7.2981	0.0	0.0	0.0	0.0	670.4	243.5	-1678.5	0.0	2.
1971.	0.9286	7.4328	7.4328	0.0	0.0	0.0	0.0	868.9	309.9	-1558.8	0.0	2.
1972.	0.9404	6.8057	6.8057	0.0	0.0	0.0	0.0	747.2	275.6	-1634.2	0.0	2.
1973.	0.9324	4.9334	4.9334	0.0	0.0	0.0	0.0	697.2	255.8	-1676.5	0.0	2.
1974.	0.9332	4.3998	4.3998	0.0	0.0	0.0	0.0	654.9	200.0	-1661.0	0.0	2.
1975.	0.9470	4.4618	4.4618	0.0	0.0	0.0	0.0	396.9	-52.6	-1912.0	0.0	2.

NONAGR (IIASA AGGREGATE)
UNIT:MILL 1970 $

YEAR	PRICES:MILLION $/UNIT WORLD PW	CONSUMER TARGET PD	CONSUMER EQUILIB	STOCKS MAXIMUM XPUMAX	TARGET XPUTAR	EQUILIB XPU	MINIMUM XPUMIN	NET IMPORTS MAXIMUM QIM	EQUILIB ZN	MINIMUM QEX	GOVT CONS XPU1	TYPE
1970.	1.0000	1.0000	1.0000	0.0	0.0	0.0	0.0	543646.0	-3785.4	-419942.0	211230.0	2.
1971.	1.0209	1.0053	1.0053	0.0	0.0	0.0	0.0	605058.0	648.6	-412005.0	213340.3	2.
1972.	0.9650	0.9082	0.9082	0.0	0.0	0.0	0.0	453912.0	8669.8	-484267.0	220859.3	2.
1973.	0.9188	0.6386	0.6386	0.0	0.0	0.0	0.0	375496.0	5334.6	-637795.0	228902.6	2.
1974.	0.8989	0.5598	0.5598	0.0	0.0	0.0	0.0	617088.0	6198.5	-551160.0	237496.6	2.
1975.	0.8888	0.5480	0.5480	0.0	0.0	0.0	0.0	647227.0	5591.1	-569355.0	246674.4	2.

Appendix D

DIFFERENCES BETWEEN USDA-MSU VERSION AND IIASA VERSION

This appendix lists the major categories of difference between the USDA-MSU version (called USWRLD) of the world food and agriculture model system and its parent IIASA/FAP version. These differences should be noted in transferring models and programs back and forth between USDA and IIASA and in making them compatible on the two computer systems.

1. Numerous FORTRAN modifications were made to correct for the incompatibilities among the compilers used on IIASA's VAX system, on MSU's CDC system, and on the IBM system at the USDA's Washington Computer Center.

2. In the IIASA version, several COMMON blocks appear in different forms in different subroutines. To reduce possible sources of error and bug-tracing efforts, each COMMON except WORK has been made exactly the same in every subroutine it appears in.

3. The detailed U.S. model solves its domestic exchange equilibrium for 35 commodities instead of the 19 allowed for in the IIASA/FAP complementarity path algorithm for national models. Therefore, the dimensions of all variables pertaining to domestic exchange equilibrium have been increased to allow for up to 35 commodities.

4. The IIASA/FAP complementarity path algorithm is designed to find the equilibrium for a national exchange module which is in the generalized linear expenditure system form or can be transformed into that form. Special logic was added to the USWRLD version, therefore, to accommodate the nonlinear U.S. detailed model.

5. In the IIASA version, national models, exogenous world prices, and international policies are initialized in separate main programs or job steps, creating the initial direct access files necessary to run the models (see Chapter 4). In this way, these initial files can be saved and reused in later runs, thus skipping the initialization steps. Since reinitialization of the files is necessary whenever the run mode, run length, or selection of countries changes (which is very frequently), the initialization programs were changed to subroutines called during an initialization phase of the USWRLD program. In cases where initial direct access files can be saved, switches have been added to the START data file (see Chapter 5) which may be set to skip over part or all of the initialization phase.

6. In the IIASA version, the complementarity path algorithm for domestic equilibrium begins with domestic demand at the previous solution value, i.e., the value resulting from world prices at the previous iteration of the international algorithm or, in the case of the first iteration, the previous year. The algorithm then goes through a feasibility phase to reach the complementarity path before beginning its search for an equilibrium solution at the current set of world prices. The number of iterations required for the feasibility phase has been greatly reduced in the USWRLD version, generally to only one in cases where no quota constraints are initially effective. This is accomplished by computing the initial level of domestic demand resulting from the current iteration's world prices rather than the previous iteration's solution.

Appendix E

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